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THE FOUNDRY

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We want to obtain examples of current foundry practice. Photographs, drawings and descriptive matter, showing just what is being accomplished in the foundries of to-day, will be cheerfully paid for.

We can not furnish a continuous set of back numbers beyond April 1900.

Entered at the Post Office at Detroit, Mich., as second-class matter.

Trade Outlook.

Following the continued fall in prices on nearly every form of finished products, pig iron too has been on the downward grade. The rapid blowing out of furnaces, reports show that the number in blast has decreased 44 between July 1st and August 1st, and the consequent restriction of output, must soon put the market in better shape. It is also to be expected that lower values will stimulate the demand of iron for export and ultimately reflect itself on the home market.

In spite of serious labor disturbances in many foundries and the general midsummer dullness, coupled with the cessation of work at many plantsowing to excessive heat, there is a fairly large volume of castings being turned out, more in fact than is commonly supposed. Buying in small lots will likely continue until prices begin to show an advance. Already several foundrymen are realizing that this is not far away and are giving orders for reliable brands in order to avoid the changing of mixtures such as occurred a year ago, when furnaces were oversold. It is generally conceded by managers of foundries that it is cheaper to pay a few cents more a ton for a select stock of iron than to buy at the lowest notch and take whatever comes along.

The Krank's Korner.

The other day I ran across a man who was gunning for a job as foreman. One of the reasons why he thought he should be entitled to something of this kind was that he had been forty-five years in the business.

I have a great deal of sympathy for the old mechanic, but really sympathy cuts but little figure. Neither does the length of time one has been working at the trade.

Forty years is a long while to pick up experience. A man ought to come pretty near having his system saturated with wisdom at the end of that period.

The trouble with the old mechanic is that he learns too much. He knows of too many things that can't be done.

The young man does not know of so many things that cannot be done. In his own innocent way he goes ahead and many times succeeds where older heads knew for sure that failure would result.

When it comes to a foundry foreman give me a man who is not old enough to know all the tricks of the trade. Give me a man with enough gumption to try to do things occasionally that others say can't be done.

* * *

Speaking of foundry foremen, it beats the band what a lot of nerve some of these one-horse foundrymen have when it comes to offering a salary.

Last fall there was a foundryman in Bad Axe, Michigan, who began to feel as if he needed someone who knew a thing or two about a foundry. In order to find such a man he caused to be inserted an advertise-

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ment in one of the Detroit papers setting forth just his particular needs. A certain foreman who contemplated making a change replied to the Bad Axe man's ad., and the latter after thinking the matter over for about a week evidently concluded that his applicant could fill the bill, for he forwarded an answer which ran something like this:

Dear Sir: If you are of good moral character, strong and willing to do a day's work, if you know how to run a shop and a cupola, and know how to turn out good castings all around, you may come up, and we will pay you one dollar and twenty-five cents a day.

That is pretty nearly as bad as that wouldbe foundryman in Harriman, Tenn., who wanted a foreman to attend to between fifty and sixty molders and do a little punching and shearing to keep himself busy.

I will bet neither one of these concerns will be in business ten years from now unless they change their policy of running a shop.

I know some molders are working for a plunk and a quarter a day, but the fact that they are doing so simply goes to prove that they are not worth much more.

The National Cash Register Company.

Among the many inventions which have been made and perfected within the last twenty years, none have filled a want more completely than the cash register. Most other mechanical necessities which we have made, was comparatively cheap, while the tendency since its appearance has always been towards higher-priced machines.

This is because the cash register is constantly being made more perfect and de-

1 and 2. Melting Room showing battery of fifty six furnaces. 3. System of ventilation.

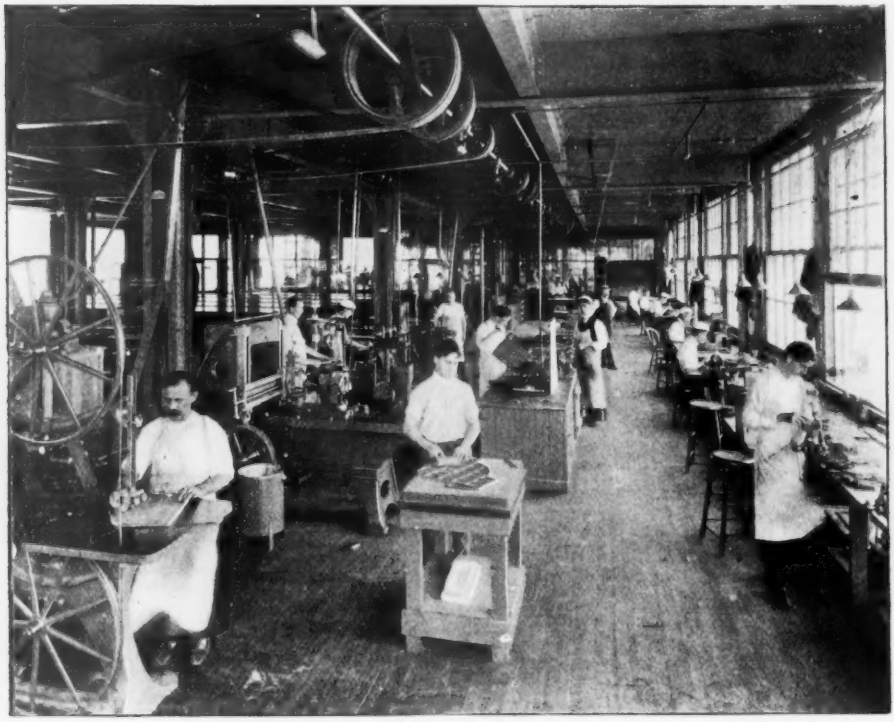
adopted and learned to use have at first been high-priced and their subsequent rapid introduction dates from a reduction in price. Unlike these, the cash register, when first

mands are being met for machines which perform a great variety of operations besides the original function of recording the amount of money received. Some of the

1. General view of foundry. 2. Same. Combined smoking and drying oven in the center. 3. View in new addition showing general arrangement of molding tubs and system of lighting.

later models of machines sent out by the National Cash Register Co. are more than human in their exactness of operation and execute so many different steps in a system of accounting that there are but few users who could afford to dispense with their services.

That the manufacture of an article as useful as a cash register should be almost exclusively in the hands of one concern seems next to impossible, and yet such is the case.



PATTERN SHOP NATIONAL CASH REGISTER CO.

There must be a reason for this and I believe it is due as much to the freedom with which ideas are exchanged between the working force and the selling departments of this company as to any other cause.

It was my pleasure to be at the works of the National Cash Register Company at a time when the selling force of the company to the number of about three hundred were meeting in international convention at Dayton, Ohio. Ordinarily conventions are looked upon as another name for a period during which those who are fortunate enough to attend can have a good time, yet here was a whole week where business ruled and social affairs were of secondary importance.

As I heard salesman after salesman refer in earnest speech to certain improvements each would like to have made in the product of the company, and when I heard the equally earnest replies that came from the heads of mechanical departments, the thought entered my mind that our manufacturers as a rule do not keep in sufficient touch with the consumer to readily grasp the faults of their product. It is plain to me that the National Cash Register Company must build machines that satisfy their customers, because the latter really dictate through the salesmen the kind of registers which must be built. The encouragement given the salesman to offer suggestions for improvement must also make him an efficient coworker and cause him to feel that he is a member of a very large family.

That the National Cash Register Company has not been without competition is shown in their "Midway No. 2," where are stored 8,468 old registers, made by ninety compet-

ing companies, including one hundred and twenty-five different styles of machines, which have been taken in exchange for Nationals. These machines represent the investment by the companies making them of a large sum, which was almost wholly lost through the failure of their registers to find a place in the market. This failure is largely due to the fact that the owners have been unable to make a durable and mechanically correct cash register, such as the National has proved to be.

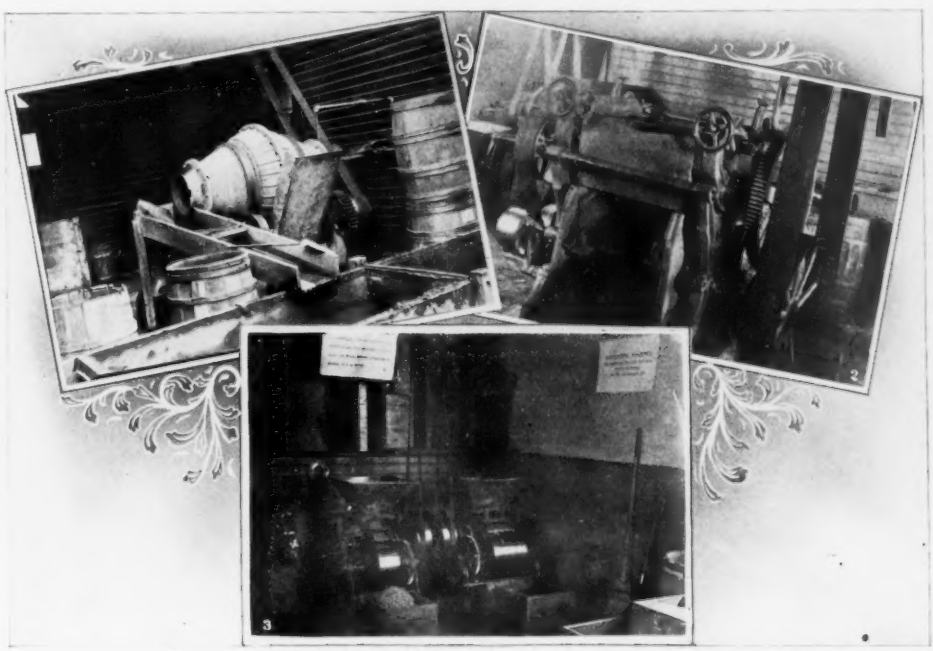
I dislike to refer to the works of the National Cash Register Co. as a factory or shop, because they are so much different from other places where workingmen toil, in management and everything else.

The visitor finds many things which are new and unique in the business and its management. These include such peculiarities as management by committees instead of superintendents, individual responsibility in every particular, personal interest in the employes and their surroundings both in the factory and at home, shorter hours and greater privileges, and constant thoughtfulness for the neighborhood of the factory, as shown in the beautiful grounds, neat buildings, comfortable homes, kindergarten, clubs, etc.

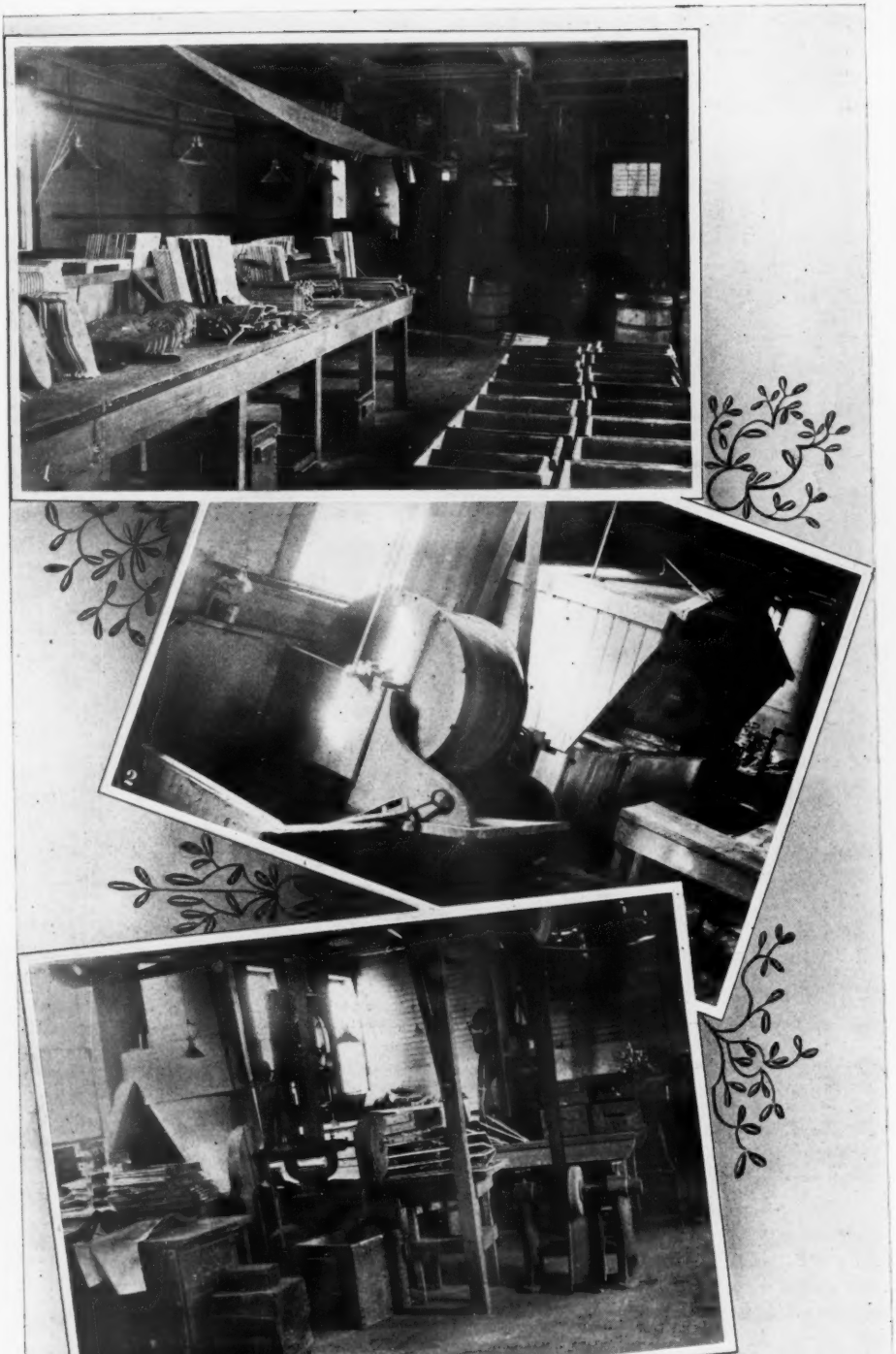
The origin of the National Cash Register Company dates back to 1882, although it did not begin busines under its present management until 1884. Growth was rapid, the number of employes at different times being as follows: 1884, 14; 1894, 1,047, 1900, 2,350. In 1894 the company found themselves losing money. The president, Mr. John H. Patterson, who until that time had spent most of his time in creating a market for the machines, moved his desk into the factory with the determination to find out what was the trouble and to rectify it. He discovered that the difficulty lay in the lack of three things: First, lack of thorough organization; second, lack of knowledge of the business on the part of the employes; third, lack of sympathy of the employes.

One of the first things done was to discharge the superintendent and to substitute in his place a factory committee composed of five men who were experts in different lines. Each man supervises the work with which he is most familiar, matters of great importance being referred to the committee.

Other things to be installed in quick suc-



1. Cinder Crusher and Washer for saving metal, 340 pounds saved daily. 2. Sand Crusher for mixing facing sand 3. Magnetic Separators for removing iron from brass turnings.



CASTING CLEANING DEPARTMENT.

1. General view. 2. Tumbling Barrel for small castings. 3. Emery Wheels, Dust Collector, Flexible Shafts and Band Saws for finishing castings.

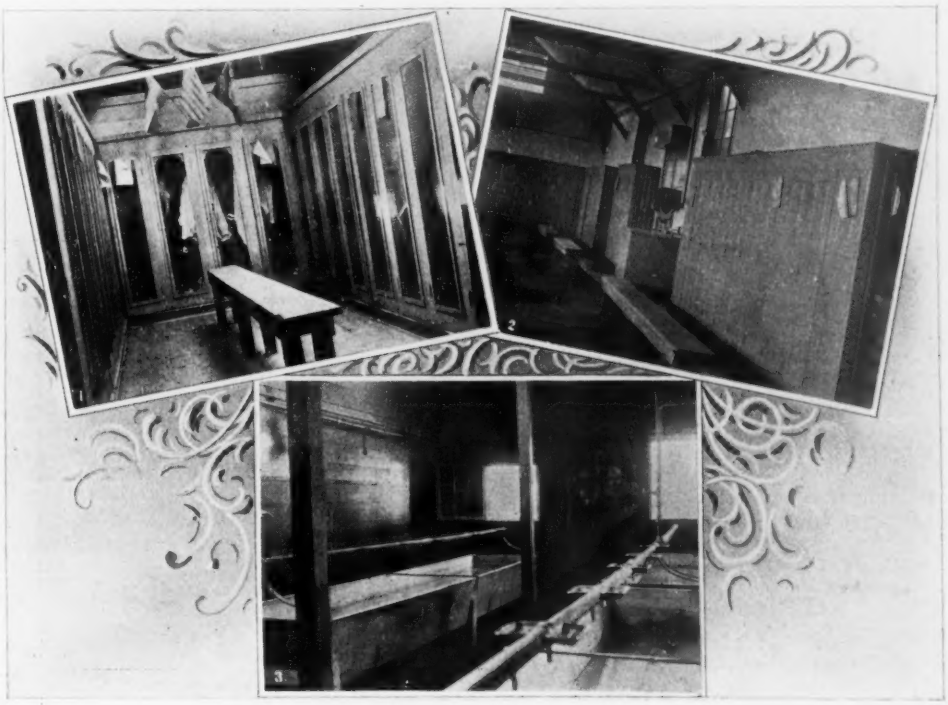
cession were: Shorter hours for men and women, baths for all, prizes for the best suggestions regarding the business of the company, literary and social clubs for men and women of the factory.

These things proved so successful and were met with so prompt a response by the employes that gradually the work spread until its good influence was felt in the neighborhood as well as in the factory. The following are a few of the advantages offered to the neighborhood: Prizes for prettiest yards, an improvement association, literary and social club for young girls, literary and military clubs for the boys, boy's gardens, kindergarten, summer playground, etc.

The result of these things has been to bring nearer together the employer and the employe and to take from the minds of the employes the belief, which is far too prevalent in our country, that whatever hurts the employer helps the employe and whatever hurts the employe helps the employer. The employes have been educated to realize that their interests and the interest of the company are mutual and that whatever hurts one hurts both.

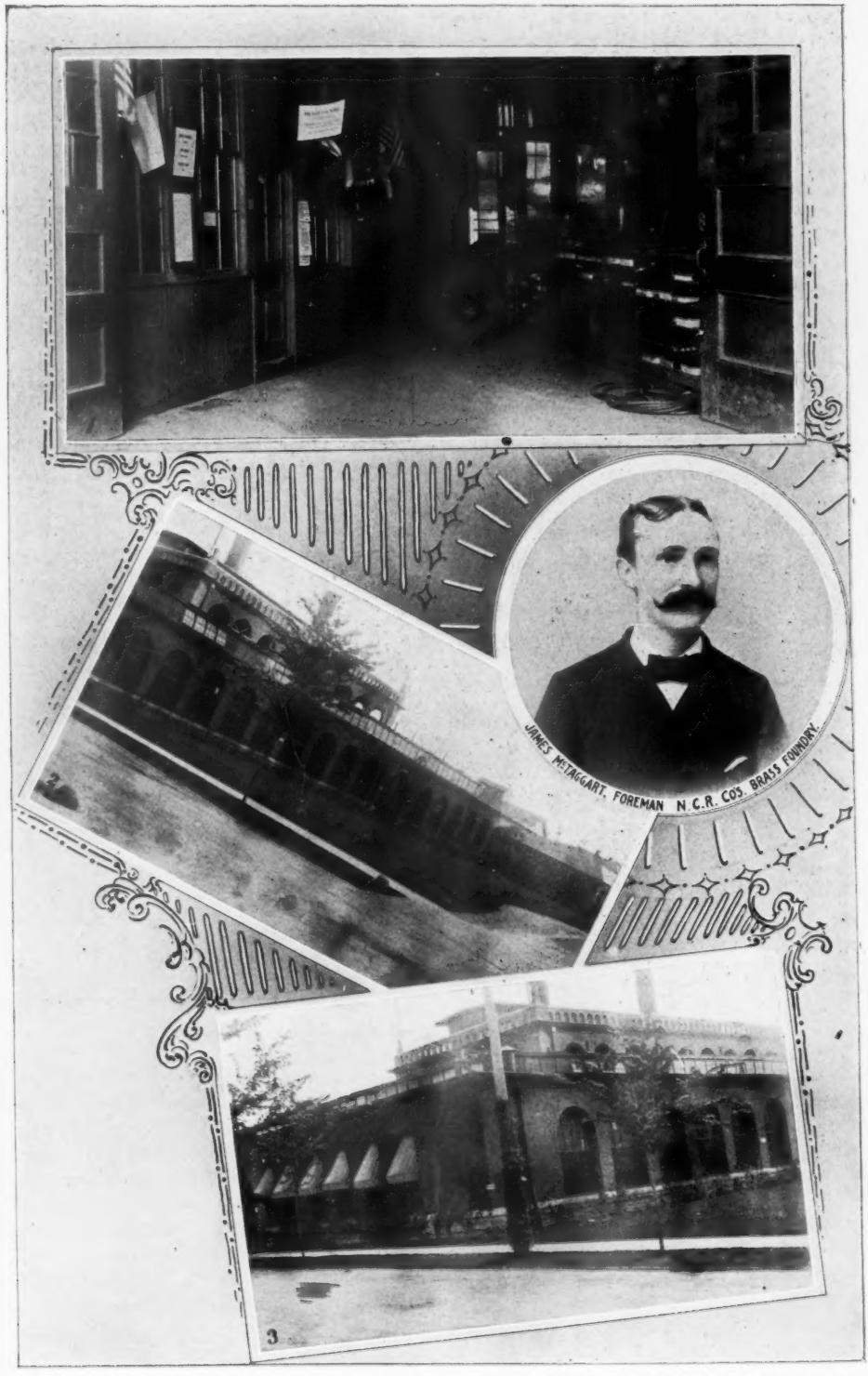
To-day the company occupies 13¼ acres of floor space, has a capital of five million dollars and, counting the selling force and others directly depending upon its success, there are nearly three thousand people engaged.

The works are divided into forty-two factory departments presided over by a factory committee instead of superintendents. In twenty-one of these departments piece work is done, nine hundred and twenty-seven people being paid on this plan. There are sixteen thousand different piece work prices and during the year 1899, 438,000 piece work tickets were handled. These figures in themselves will give an idea of the immense amount of detail work necessary. There are also twenty-three office departments.



1 and 2. Workmen's Closets, ventilated and ordinary. 3. Wash room.

Special attention has been paid to the comfort of the employes, not from any philanthropic sentiment, but, as one officer of the company expressed it, because it pays. One who has been accustomed to ordinary shops sees here many features which at first sight would appear to have no bearing whatever upon the manufacturing side of the concern. For instance, the company has set



1. Entrance to foundry. Foremans office to the left. 2 and 3. Exterior views of the National Cash Register Company's Brass Foundry.

aside a piece of land for the boys of the neighborhood on which they are at the company's expense instructed in the art of gardening. The plot is in charge of a competent gardener and prizes are offered for the one having the greatest success. The view which the company holds of this enterprise is that their future workmen must be drawn from their own surroundings and it is much

OVEN FOR SMOKING MOLDS.

better that these young people should be employed when out of school instead of spending their time on street corners. It is expected that habits of industry early instilled will ultimately result in steadier workmen and in that way reimburse the company for the outlay.

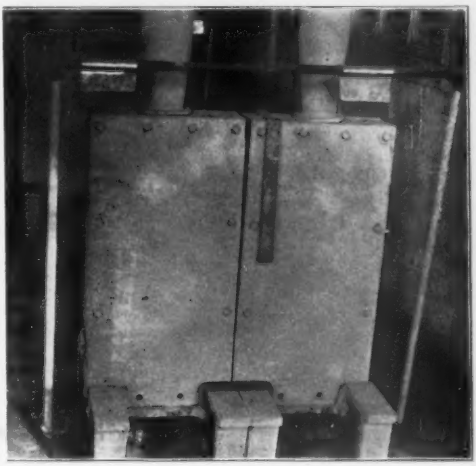
It is impossible in an article of this kind to do justice to each and every feaure connected with the plant. Visitors to Dayton are always welcome and escorted throughout the factory and as an eye opener to new and original methods the trip is something which no one should miss. One cannot leave there without being imbued with the idea that all work is well done.

In point of cleanlines, neatness and system throughout, only a visit can convince the reader of its extent. At convenient points through the works are located small desks with the sign, "Complaints and Suggestions." Paper and pencil are at hand with which any workman may make a note of any individual grievance or make a suggestion whereby the product of the company may be either bettered or reduced in cost of production. Careful attention to the contents of these notes is given and prizes are offered each year for those that are most valuable.

During 1897 about four thousand suggestions were made by employes, of which 1,078 were adopted for use in some department of the business. In the next year 2,500 suggestions were made, showing the improvement in work and the difficulty of finding new points of change.

Six hundred and fifteen dollars in gold is given each six months in prizes to the fifty members of the factory and office forces making the best suggestions for improvements in the manufacture of registers or in the conduct of the business. These prizes vary from $5 to $50 each. Officers, heads of departments and their assistants are barred from the competition, so that the opportunty is open to the rank and file for successful effort. One hundred dollars in gold is also given each month to the two salesmen making the best records of sales for the three preceding months.

The National Cash Register Co. operates a brass foundry but not an iron foundry, although it would seem as if it would pay them to make their own iron castings also. The brass foundry is situated in a separate building and is presided over by James McTaggart, who is assisted by John Logan. The melting room contains fifty-six furnaces. As in all other departments, system pervades everything. This will be all the better understood when it is known that of the great many different grades of brass



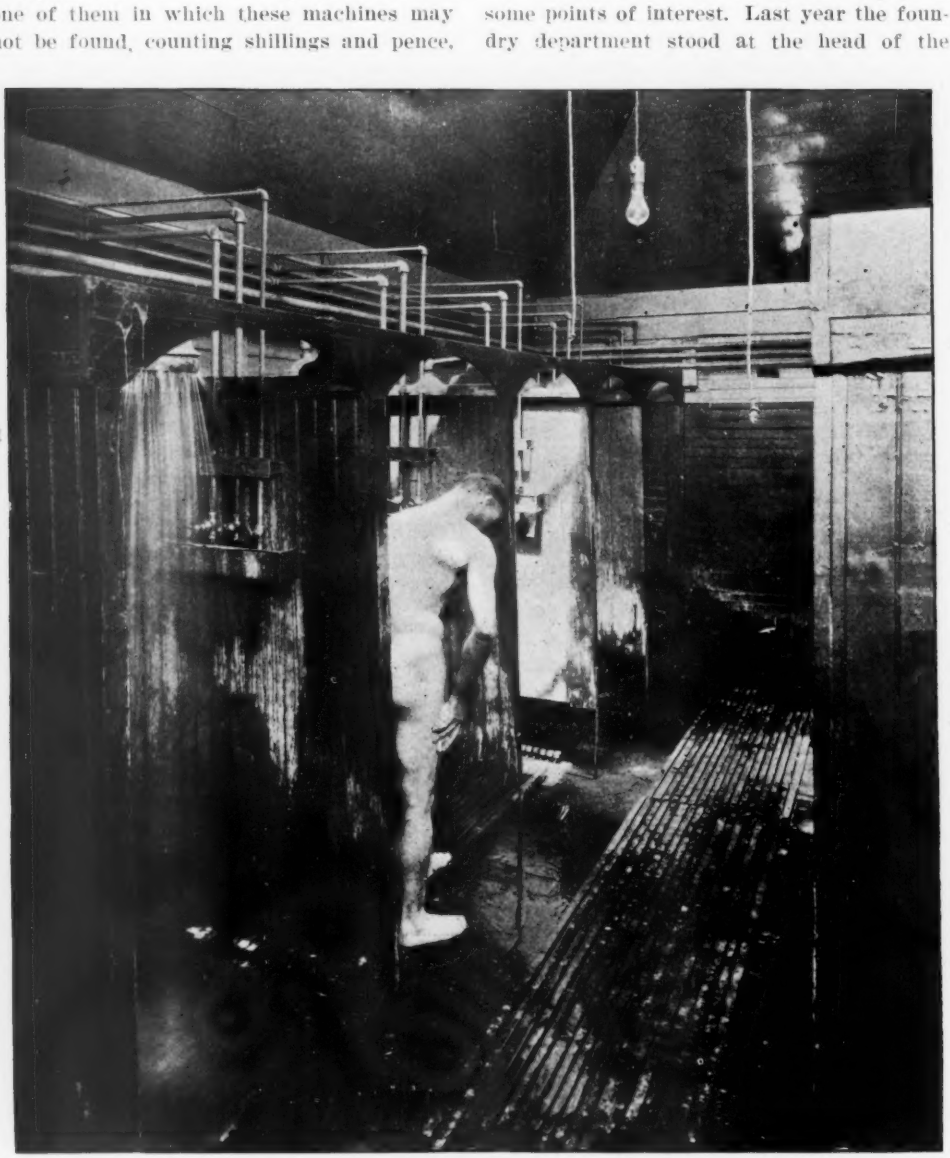
GAS HEATER FOR DRYING MOLDS.

and bronze turned out, a casting having a similar composition and consequent color can be duplicated at any time.

It is needless to refer to the high grade of brass castings made here because every

reader of this article may judge for himself by examining a National Cash Register. THE FOUNDRY goes every month to over thirty different nations and yet there is not one of them in which these machines may not be found, counting shillings and pence, marks and phennings, kroner and ore with the same fidelity they show at home keeping track of dollars and cents.

A vast amount of statistical information is compiled daily showing the condition of every department, its efficacy, health and other items. This is posted in a conspicuous place in each department where everyone may become acquainted with the facts. Every year the department which makes the best showing is honored by an outing to some points of interest. Last year the foundry department stood at the head of the class and everyone employed therein was taken on an excursion to Cincinnati, a special train being chartered for the occasion and all expenses incurred on the trip paid by the company in addition to the regular wages of the employes.



SHOWER BATHS IN BRASS FOUNDRY OF THE NATIONAL CASH REGISTER CO.

Our illustrations show so many points of

interest throughout the foundry that an extended description will be needless. However there are always some points missed in the photographic illustration of a plant. The molders besides the washroom shown in one of the illustrations are also furnished with a separate room containing shower baths. Anyone at all familiar with a foundry knows with what persistency dust and dirt attach themeslves to the molders. Being provided with private closets where clothes may be kept clean and dry, and having a natural inclination to keep clean, the molder at this place can go home without the usual trade mark of the shop clinging to him.

Every effort is made at this foundry to prevent waste through the use of washers, magnetic separators, etc. For brushing castings a flexible shaft carrying a circular brush is employed. This is a very rapid and effective method of removing sand from light castings and it is rather surprising that this device has not been more extensively adopted. Where castings are gated from the outside a band saw is used to remove them, and the ease with which this is done is really remarkable as is also the rapidity with which a defective casting is cut up in pieces suitable to be melted over again.

Among the many innovations to be seen at this foundry is an electric mechanical rapper on some of the molding benches. Whenever a molder has a job requiring rapping in order to obtain a clean lift he simply touches a button with his knee, instead of calling upon one of his shopmates as is usually the case. This arrangement must commend itself to practical men as a time saving feature.

It occasionally happens that it becomes necessary to call upon the men to work overtime in which case the company furnishes them with a lunch free of charge.

H. H.

Mixing Irons.

BY EDWARD KIRK.

There is a general impression among founders and molders that different grades of iron, when brought together in a molten state, mix and enter freely into combination with each other, forming one homogenous mass. Under this impression, cupolas have been especially designed for mixing irons, by collecting a large body of molten iron in the cupola before tapping. That this impression is erroneous and that different grades of iron do not mix, by merely being brought in contact with each other in a molten state, is clearly proven by the iron drawn from blast furnaces, in which molten iron is permitted to collect in the furnace crucible for from six to twelve hours, the length of time depending on the size and working of the furnace.

It is the custom to tap the furnace after a certain number of charges of ore, fuel, etc., have been placed therein, this having proven to be the best guide furnacemen have, as to the inside working of the furnace, and indicating when the crucible is full. During this time the crucible is slowly being filled with iron smelted from the ores, and the iron is not drawn from the furnace until many tons have collected in one molten mass.

Yet careful analysis has shown that the iron, when drawn from the furnace and cast into pigs, is not of an even grade throughout the cast. This indicates that iron smelted from different grades of ore do not enter freely into combination with each other when brought in contact in a molten state, and even when permitted to remain in contact in this state for many hours.

This being the case, it is useless to place tuyeres high in a cupola for the purpose of collecting iron in the cupola to mix it before tapping, for the extreme length of time a rapidly melting cupola can be allowed to remain without tapping is probably fifteen or twenty minutes. If molten iron is not mixed in a furnace crucible in from six to tweive hours it is not at all likely that the same irons will mix in fifteen or twenty minutes when remelted in a cupola.

Fluid bodies are not readily mixed by merely being brought in contact with each other, but may be rapidly and thoroughly mixed by being put in motion.

If we take two or more different colored waters and carefully place each of them in a considerable body in a bottle, in such a way as to not mix, when placed in contact with each other, they will remain separate and distinct for many hours, only slowly blending with each other; but, if after bringing them in contact with each other in this way, we pour the contents of the bottle from

one bottle to another a few times, the color of each water disappears and a new color is formed in a minute, that would have taken hours to produce had not the water been put in motion. If in place of bringing the colored waters in contact in a large body we bring them together in drops, the identity of each is at once lost, and a less motion is required to thoroughly mix them.

The same is the case with molten iron, and by bringing the different grades together in drops and putting them in motion by drawing the iron from the cupola at once, a mixture is affected with less motion than when the iron is permitted to remain in the cupola, and the different grades as melted are permitted to drop into several pools by themselves, in a mass of molten iron, only to be mixed with each other when drawn from the cupola.

Two totally different metals may be mixed to make an apparently perfect mixture when in a molten state, but they separate to a greater or less extent when solidifying, and each retains its identity. This is the case where two totally different irons, such as a highly carbonized iron and a highly oxidized iron are melted together, and accounts for the small nodules of white iron sometimes found in iron when a very soft iron and a burned iron are melted together.

A less number of these nodules are found when the irons are brought together in small particles or drops than when brought together in large bodies, and may by careful mixing be made to entirely disappear if the oxidized iron is not melted to excess.

It should be the aim in charging to place the different grades of iron in a cupola in such a way, that when melted, they may be brought together in small bodies in their descent through the fuel after melting, and also at the bottom of the cupola, and not to melt them separate and distinct and to allow each to descend to the bottom and form in separate masses or pools, only to be mixed when drawn from the cupola.

This can only be done by breaking the pigs in short pieces and mixing the various grades when charging, by carefully placing the different grades in contact with each other in small pieces, so that when melted they will come in contact as they trickle through the fuel to the bottom of the cupola.

This precaution should not only be taken when melting different brands of iron, but also when melting only one brand of iron; for it has been shown by analysis, and also by fracture, that two or more grades of iron may be found in the same pig. And by melting the two ends, or different parts of the pig in contact with each other, and permitting the iron from each to mix as melted, a more even iron is produced.

When mixing irons to obtain a certain quality of iron from the mixture, better results are obtained by mixing irons having as near the properties required as can be obtained than by trying to produce it from two extremes such as making a medium hard iron from an extreme soft and extreme hard iron, by mixing them in certain proportions; or making a medium strong iron from an extreme strong and an extreme weak iron.

Opposite extremes in iron do not mix well, and in making mixtures we should avoid melting them together, as is frequently done under the impression that a small amount of very hard iron is softened by a large amount of soft iron, and vice versa.

A small amount of hard iron would no doubt be softened and made to entirely disappear in a large body of soft iron, if minutely divided and thoroughly mixed with the soft iron, but if this is not done and the irons are brought together in a considerable body each retains its characteristics, and the hard iron may be found in the soft, as a hard spot in a casting. And hard spots can frequently be traced to small pieces of very hard iron placed in the cupola with the scrap.

To thoroughly mix irons they should be kept in motion from the time they are melted until they are poured into the mold. This can only be done by making the tapping hole of a size that will admit the iron flowing from a cupola as fast as melted and running a continuous stream from the cupola. This is the common practice in stove plate and bench work foundries, and a more even iron is made in these foundries than any other.

When hand ladles are not used and the iron is handled in small bull ladles, a broad-topped, shallow-mixing ladle that will admit of a ladle being filled from it, while the stream from the cupola is running into it, should be placed under the spout and the iron poured from this ladle into the pouring ladle.

When work is heavy and only large ladles are used, they should be placed under the spout and filled with a continuous stream; or the iron placed in them from the mixing ladle with small bull ladles. In either way the iron in the large ladle is not permitted to remain at rest until the ladle is filled.

To promote the mixing of irons, they should be melted fast and hot, for two semi-fluid bodies do not mix as readily or as perfectly as they will when in a very fluid state. This may be illustrated by mixing two oils when cold and the same oils when heated. The more fluid we can make the different grades of iron when melted, the more readily they will mix with each other.

Iron when drawn from a cupola should be at a white heat and sufficiently fluid to run the lightest of castings, and should be poured hot to produce a perfect casting and an even iron throughout same.

When mixing iron for a certain grade or class of work for which a soft, strong iron is required, a mixture of irons containing these properties should be made, and in mixing iron for castings in which hardness is required hard iron should be selected.

Some Debatable Points in Cupola Practice.

BY ALEX. MOORE.

Mr. Gilmour's article on Cupola Practice appearing in the August issue has accomplished something. It has set me to thinking on some of the points of which it treats, and I am going to give voice to my thoughts as they at the moment appear.

In the first place, I think it is possible to have perfect combustion without a forced draft. I am inclined to believe that the reason why we employ a fan in running a cupola is chiefly to cause rapid combustion and a higher temperature than would be possible without forced draft. In fact, I think that combustion would be more perfect without it, although the melting of iron would be out of the question.

It has been my pleasure during several winters of cold weather to work in the neighborhood of some large salamanders, with which the owners of the shop have kindly volunteered to keep the shop in working order. I feel that complete combustion occurred of the coke placed in these salamanders. If it didn't it was not because there was a lack of air. I know there was a sort of an odor of a gaseous nature in their vicinity, but whether this was carbon dioxide or monoxide I never knew.

Mr. Gilmour's illustration shows a number of popgun tuyeres at different heights, with which he vaccinates the monoxide as it tries to leave by way of the fire escape without a permit from the board of health. In this respect Mr. Gilmour's idea strongly resembles the tuyere arrangement of the Herbertz cupola, which has a spiral track of small tuyeres extending from the melting zone to the charging door. It is to be noted that none of these combustion-promoting schemes have ever retained any permanent hold. As long as the proprietors' faith held out the tuyeres worked wonders, but when it came to figure up the net result there was no gain.

From Mr. Gilmour's figures I find that if he charges 2,700 pounds of coke on the bed of his 58-inch cupola, followed by four charges of coke of 350 pounds each, and twenty-one charges of 300 pounds each, interspersed with twenty-six charges of iron, consisting of 4,000 pounds each, that he will have melted 104,000 pounds of iron with 10,400 pounds of coke, or at the ratio he quotes, one to ten. This is good melting, but still I think that the man who melts 4,000 pounds of iron in a 24-inch cupola at a ratio of one to six does better.

I have never tried Mr. Gilmour's remedy of throwing two or three shovelfuls of soft coal into the cupola before dropping the bottom in order to have a clean drop, although in his case I should think this would be entirely unnecessary. The first requisite to a clean drop is that a cupola shall melt hot throughout the heat. It is only where cupolas get bunged up that there is trouble in securing a clean drop. As Mr. Gilmour melts 52 tons of very hot iron I am sure his tuyeres will not bridge over, and for that reason he could possibly save his soft coal. When one takes into consideration the fact that a considerable number of the heat units contained in this would likely be converted into monoxide and lost, the gain by not using the soft coal would amount to something at the end of twenty-five years.

If Mr. Gilmour runs across any more coke which is so rank and vile that it fills his cupola with slag, to the extent of flooding his whole charging scaffold, I should certain-

ly advise him, first, to get a fireproof scaffold and, second, to use a little limestone and draw a portion of the slag off before it reaches the charging door.

Now I don't want any one to think for a moment that I do not fully believe this slag experience of Mr. Gilmour's. I have ran across some great phenomena myself, which I have so far refrained from printing, for fear some one would not believe them. However, as far as I have observed melting, when the slag reaches the tuyeres of a cupola during a heat it will enter same and fill the wind box, ultimately blocking the tuyeres altogether. Wnat bothers me is to comprehend how the slag got above the tuyeres without interfering with the blast. If such a thing should occur in any cupola under my control I should strongly suspect my melter of having charged several packages of yeast or baking powder along with the iron, and I would be inclined to fire him on the spot.

The influence of irregularity in atmospheric pressure upon the melting ratio is a subject that has not received the attention it deserves. I can readily see its importance and, as the technical men in the trade are now six months behind in the delivery of orders, I propose that the rest of us settle this question, immediately if possible.

Now while some people may smile at my anxiety to get this thing determined, these should remember the amount of heat units that are going to waste because we have not yet learned to charge our cupolas according to the barometer, or density of the atmosphere. To illustrate this, let us suppose that Mr. Gilmour uses 300 pounds of coke to a charge, as shown in another part of this article. It is plain that if the barometer stands in his favor that he can get along with less coke. Of course there would be some days when he would need the full 300 pounds, but suppose the game is coming his way, it will readily be seen that an intelligent consultation of the barometer will save coke. For instance, the atmosphere gets heavier after Mr. Gilmour has put a few charges of the regular weight in the cupola, and in the next one he may be able to get along with 299 pounds. Maybe before the following charge is ready the barometer will show that he can get along with 297 pounds. Take it on a summer's afternoon, when thunderstorms are numerous and the chances for saving coke by charging according to the fluctuations of the barometer are many.

To illustrate the real value of properly understanding the density of the air and the weather man, let me say that there are about four thousand foundries in operation in the United States. Suppose each one saves a pound of coke to a heat, there is two tons, net weight, worth all the way from three to ten dollars according to Frick and the location of the foundry. Let those who doubt possible economies along this line just save one pound of coke, their first effort will convince them how easy it is of accomplishment.

I do not know where Mr. Hart got the figures which Mr. Gilmour borrowed for this occasion, but if the blast furnace he is connected with uses 4,320 pounds of coal to produce a ton of iron it had better hire a new manager, who will pay more attention to the furnace and less to the thickness of the air.

John W. Duntley.

Preeminent among those who have met with success based upon experience in the foundry business stands Mr. John W. Duntley, the founder, organizer, promoter and president of the Chicago Pneumatic Tool Company of Chicago. This company was the pioneer in the application of compressed air to various appliances designed to take the place of the hand tools formerly used. Though still a young man, Mr. Duntley has attained a life's success. He had his first experience in practical business as a foundryman at Northville, Michigan, where he spent his boyhood, shifting from there to Detroit, Milwaukee and Chicago as each opportunity for advancement presented itself. Graduating from the superintendency of one of the largest foundries in Chicago, Mr. Duntley entered the railway supply business and for many years was recognized as one of the most successful salesmen in that line, representing during that time many leading houses, notably the American Steel Casting Company, the largest of its kind in the United States, the St. Louis Steel Foundry, National Machinery Company and like concerns.

It was during this period that he formed the acquaintance of Mr. Joseph Boyer, of

St. Louis, a mechanical genius of extraordinary ability. Mr. Boyer had invented a railway speed recorder and a computing machine which were considered marvels of ingenuity. He had also an idea of applying compressed air to a hammer for the purposes for which ordinary hammers were used in manufacturing plants, in foundries for chipping iron, in boiler shops for riveting and calking, in stone yards for stone cutting. Mr. Duntley with his keen perception of merit, foresaw the possibilities of this small beginning and interested himself in the sale of the Boyer hammer. With his personal standing as a foundation and his indomitable push and selling ability, he soon demonstrated that the pneumatic hammer was not only a mechanical possibility, but a commercial necessity. In the course of a year he had blazed the path so clearly that he could see his way to a greater application of this wonderful power to mechanical purposes, and at about this time he organized the Chicago Pneumatic Tool Co., with a capital of $60,000. Never tiring in his zeal, he pushed ahead until at the present time his company is capitalized at $1,000,000. The New Taite-Howard Pneumatic Tool Company was organized in Europe with a capital of $550,000. Other foreign connections were made on a very broad basis, until now the current announcement of the company that "Chicago pneumatic tools are used all over the world," the catch line of the company's present advertisement, is literally true. It may be said that no representative ship-yard, railroad shop or manufacturing plant is without them.

JOHN W. DUNTLEY.

From the nucleus of the hammer the line has been extended until it now includes almost every conceivable sort of tool formerly operated by hand, including drills, riveters, wood-boring machines, bolt nippers, flue welders, flue reducers and expanders, chiseling machines, stay bolt chucks, ring grinding chucks, flue cutters and motors, stay bolt cutters, pneumatic sand rammers, pneumatic oil riveters, heating forges, pneumatic cranes, pneumatic hoists, pneumatic rock drills, pneumatic bell ringers, and in fact, as stated above, there is scarcely a line of work in foundry, machine shop or ship yard to which some of the appliances of this company are not adapted.

Every year sees such an immense increase in the business of the company that the plans for the enlargement of the various plants in anticipation of orders made the year previous are entirely outstripped and the greatest difficulty encountered by the company is the prompt filling of orders. Heretofore the main factory has been at St. Louis, still under the direction of Mr. Boyer, and the main eastern plant at Olney, a suburb of Philadelphia, where the plants of the Olney Metal Company, National Pneumatic Tool Company, and the Whitelaw Company, formerly of St. Louis, have been consolidated into one plant. The factory now building at Detroit will be the largest and finest machine shop for the manufacture of small tools in America, but even now it is feared that an enlargement of this great

plant must be made to meet the requirements of the company.

It may be of interest to note that during Mr. Duntley's previous visit to Europe, at least two of which he makes annually, the Emperor of Germany was so much interested in the operation of these tools at the German navy yard that he devoted the larger portion of a day to the inspection of same and actually operated the tools with his own hands. All through the countries of Europe the public officers take a similar interest in this new "Yankee wonder," as they term the pneumatic tool in their own tongue.

Mr. Duntley is at present in Europe in attendance upon the exhibit of his company at the Paris Exposition, where it has two separate and distinct exhibits, eclipsing anything attempted in a similar line. In addition to the presidency of the Chicago Pneumatic Tool Company and the New Taite-Howard Pneumatic Tool Co., Mr. Duntley is also president of the New York Air Compresor Company, New York, and vice-president and director of the Franklin Compressor Company, Franklin, Pennsylvania. The best feature of the case, however, lies in the fact that Mr. Duntley is still a young man, only 36 years old, ambitious, full of push, of genial manner and impressive presence.

THE FOUNDRY offers to Mr. Duntley its congratulations on his present success, as well as his brilliant prospects, as it is evident to the casual observer that his career has just begun. With his domestic and foreign prestige, the friends he has made by introducing these labor-saving and consequently profit-producing appliances, has endeared him to the hearts of the most prominent manufacturers both at home and abroad, and it is a pleasure to us to predict for him a gloriously successful future.

The Experience of a Foundry Foreman.*

That "it takes all sorts of people to make a world," is an old saying, and I know of no better place to see this old adage in its true light than in a foundry. Watch a molder for an hour and you cannot only form a pretty clear idea of his ability as a mechanic but also of his character, for to an observing person the slightest actions are an index to his character. Have you ever had a man approach you in this manner: "Say, boss, can you gimme a job? I'm an all-around good molder; heavy or light, bench or floor. Have just landed in town and would like to get to work." You put him to work and watch him for a while. Without doubt you will see him work away with his sleeves dangling over his hands, and his floor will in a short time look like a mud road on a rainy day. His shovel will have half an inch of sand clinging to it, and rather than clean the blade he will plow through the sand heap using twice the necessary strength. His mold will be on top of six or eight inches of said instead of down on the proper level of the foundry floor. The partings of the mold will look as if rats had been digging holes in them, and you may look for a goodly per cent of his castings in the scrap heap. Then again you are confronted with the man who believes that he can give you eminent satisfaction and is perfectly willing to have you judge his ability after giving him a fair trial. You may not see his rammer flying up and down like the piston rod of an upright engine at full speed; on the contrary, every stroke is gauged and is aimed at the right spot. He will clean up around his mold after "lifting off" and the edges and corners of his mold will be sharp and neat. It will hardly be necessary for you to see his castings before putting him down as a good man to "tie to."

Then there is the piece worker who will complain loudly when he is given an unaccustomed job. But when informed that owing to the absence of the man to whom the work is usually allotted he has been selected, he will be appeased and will work the harder and better, just to show you that he can.

If you catch one of the boys hitting another in the ear with the blacking bag, do not send him to the office for his money but tell him to go and get the "gagger board and make two barrowfuls during the heat," see that he does so, and the next time he desires to have any sport he will take good care that the foreman is not handy. A boy may come to you with tears in his eyes, worked up and nervous over some misfortune to his mold, and will want to quit. Instead of letting him carry out his determination, after he cools off show him his mistake so that he will know better the next time and in the end he may turn out to be a valuable hand. So it is with the core-maker, cupola tender, chipper, and laborer. Of course you will find

*From an address by Benjamin D. Fuller before the Pittsburg Foundrymen's Association.

the "beat," and when you do lose no time in discharging him. In the end there is no iron-clad rule for governing a lot of men to secure the best results. For after all what are men but grown up children, all having peculiarities and eccentricities and, as Burns would say, "A mon's a mon for a' that." I repeat that the foundry is a good place for the study of human nature.

Different Ways of Working.

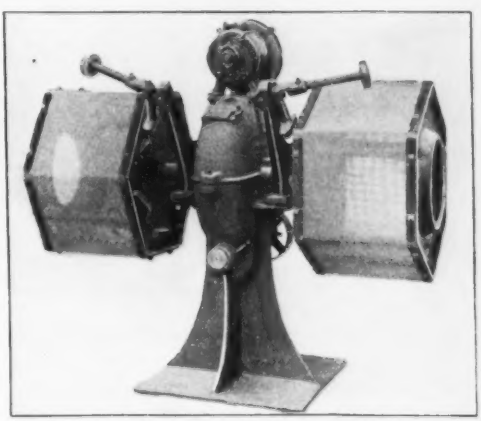
As one travels and works in different jobbing shops, he sees a good many different ways of working. Some shops would never think of bedding a piece in the floor, while annother shop would not think of rolling a large piece over unless it was impossible to get a good bed without it. Another shop will use skim gates on everything and others will very seldom use them, while some never use them at all, but use "pop" or "pencil" gates instead; if not on the casting direct, they will use them on the joint, and, as far as I have seen, produce just as good results. In fact, I think the "pencil" gates are not used enough (if the sand will stand it) as a good, clean casting is assured if the gates are not too big and the runner basin is kept full with a fair quality of iron. With some iron we get it is impossible to get a clean casting. Another thing in favor of pencil gates on top of a casting is that there is not the same strain on a mold.

Another custom in some shops is to put lots of gates on a casting. Of course some castings demand such treatment, either to keep them straight or to run them. I worked in a shop once where the foreman made an 8-inch column, 10 feet long, 1¼-inch metal, and put a crane ladle, 2 "bulls" and some hand ladles on it; while another shop would only put a crane ladle on. I worked in a shop where a foreman made a plate 10 inches wide with a rib 3 inches deep on one side, 10 feet long and 2 inches thick. He bedded it in the floor, putting one end about 3 inches lower than the other, so that it would run. It was cast, and when it came out it was about half an inch thicker at one end than the other. It was broken up and the next one made on the level, which was all right. Another thing came under my notice in a shop where very heavy work was made relating to the use of the feeding rod. Some of the men would feed their work up all right, but others, when feeding a piece, would take the rod out when the casting was very liquid and the rod was away down in the casting. As these castings had to be solid and stand a test, the consequence was there were more broken up than were good, and when broken they showed the deep shrinkage, through (in my estimation) insufficient feeding. In this same shop, no matter how thick a casting might be, they would never use a rod more than half an inch thick. While I would not be sure that a thicker rod would be better, yet I have the impression that it would, and I certainly would have used a five-eighths inch rod on the castings that shrunk. I believe a five-eighths inch rod would not have produced a worse result, at least.

I would like to get the views of some of our members as to whether a small rod or a thick rod is beneficial for feeding heavy works.—Thomas A. Haigh in Iron Molders Journal.

The Gould & Eberhardt Sand Sifter.

In designing and placing upon the market the Eberhardt Patent Automatic Sand Mixer and Sifter, Messrs. Gould & Eberhardt, of Newark, N. J., had in view the abolition of the crude, costly, back-breaking method of hand sifting, and a consequent reduction



EBERHARDT PORTABLE DOUBLE END SAN SIFTER, FOR THE WESTINGHOUSE MACHINE CO., PITTSBURG, PA.

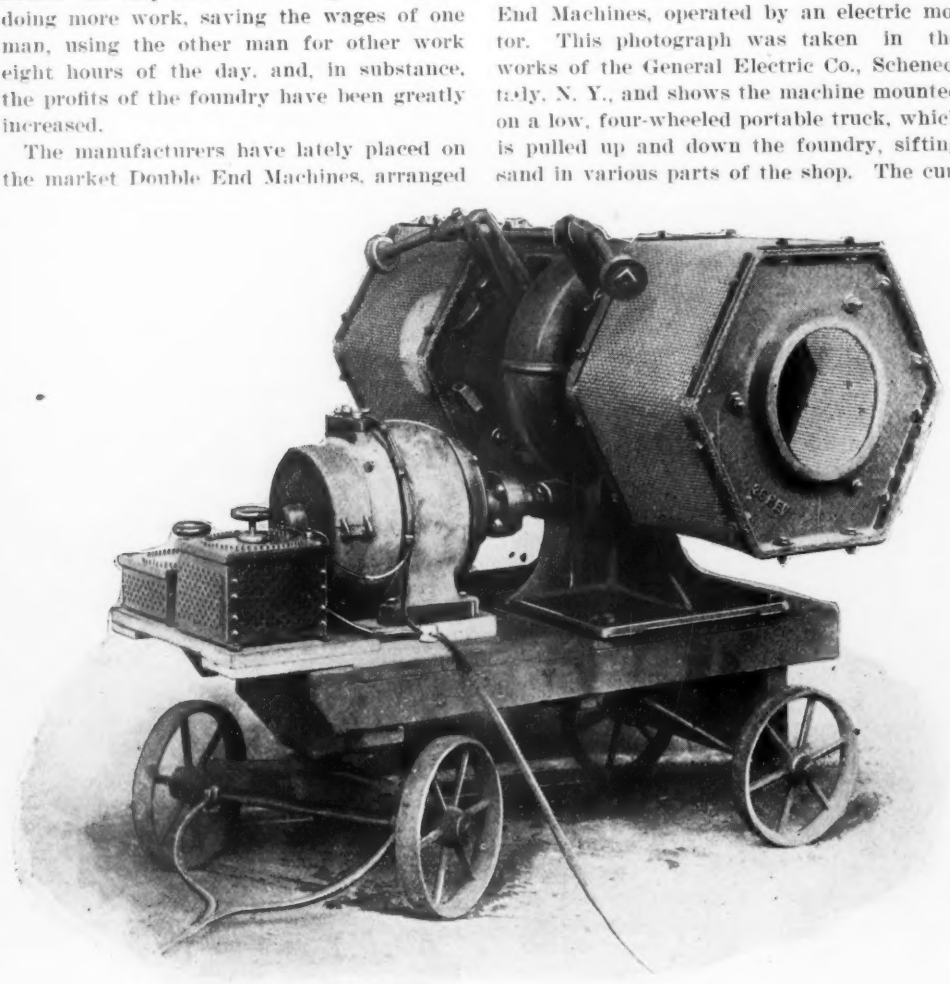
of one of the items of expense connected with the foundry. The necessity for such a machine first occurred to them in their own foundry; formerly it took two of their men ten long hours to mix and sift sand, while

now they use one of their Automatic Sand Mixers and Sifters and one laborer mixes and sifts the same amount of sand in two hours. So they are now mixing more sand, doing more work, saving the wages of one man, using the other man for other work eight hours of the day, and, in substance, the profits of the foundry have been greatly increased.

The manufacturers have lately placed on the market Double End Machines, arranged for driving by either electric or compressed air motor, to meet the requirements of shops having electrical or compressed air motive power. They are also constructed for driving by belt. With this machine only five minutes are required to mix and sift four cubic yards of sand, which formerly required thirty minutes to riddle by hand. The saving is about 83½ per cent.

There is no delicate mechanism to get out of order, and every part is substantial in construction and built for wear. Core and facing sand, after being wet down, can be sifted as readily as dry sand. The machine is easily cleaned without stopping the machine.

Our illustration shows one of their Double End Machines, operated by an electric motor. This photograph was taken in the works of the General Electric Co., Schenectady, N. Y., and shows the machine mounted on a low, four-wheeled portable truck, which is pulled up and down the foundry, sifting sand in various parts of the shop. The current for operating the electric motor is derived from a flexible cord connection, which is attached to plugs conveniently located in various parts of the works.



EBERHARDT PORTABLE DOUBLE END SAND SIFTER, MOTOR DRIVEN, IN WORKS OF GENERAL ELECTRIC CO., SCHENECTADY, N. Y.

The mixer is operated through a worm on the armature shaft, engaging a gear mounted centrally upon a shaft carrying a sieve at each end. The motor and gears are inclosed in dust proof casings. An adjustable tapper is provided for each sieve, which serves to keep the meshes always free and unobstructed.

In addition to the illustration of the sand

sifter in use at the General Electric Co. at Schenectady, N. Y., we also illustrate another machine ordered by the Westinghouse Machine Co. at Pittsburgh, Pa. In the latter shop, the sand sifter, instead of being hauled from one part of the shop to the other on a truck, will be carried from place to place by the traveling crane.

For shops doing jobbing work this furnishes an ideal method of procuring a supply of well mixed sand. There is no question but what it is cheaper to take the machine to the work than it is to carry the sand to the machine and back again.

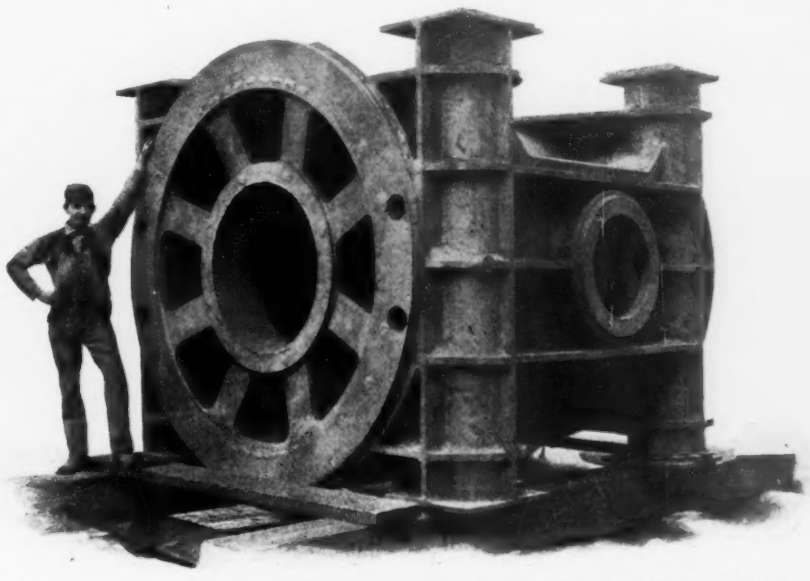
Some Corliss Cylinders.

BY. J. S. STIRLING.

In a short article which appeared in the May edition of THE FOUNDRY, from the pen of H. Fisher, he alluded to certain Corliss engine cylinders which he had been engaged in making. Since its appearance, many inquries from different parts of this country, together with one from Manchester, England, showing interest in and a desire to know more of these castings, has led me to offer the following sketch, constituting roughly a short history of their manufacture at the foundry of The Harlan & Hollingsworth Company, Wilmington, Delaware, the first concern to build iron sea-going vessels in this country, dating its existence back to 1836.

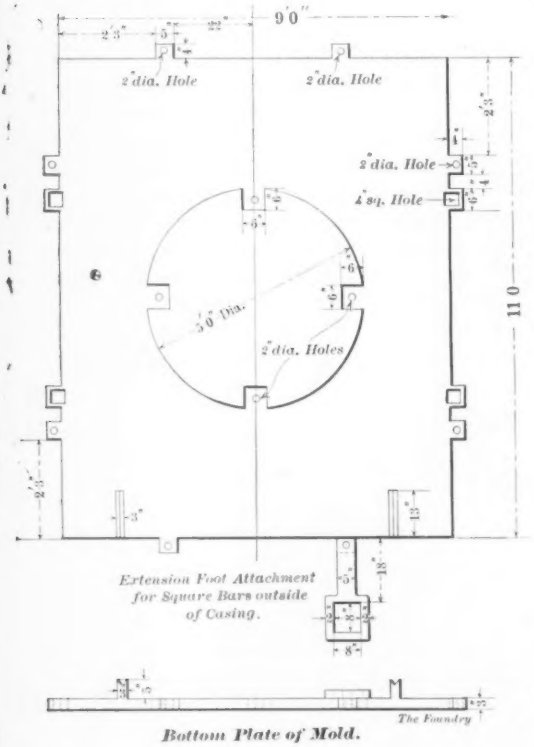
The type of the cylinder we are considering is a low pressure steam Corliss; dimensions: 78″ bore by 60″ stroke; length over all 9′-9″; breadth 7′-9½″; height 8′-3¼″; weight 44,000 lbs. (cleaned). This for our foundry was a very large casting, equipped as we happened to be with no traveling crane, and having to depend upon the efficiency of old-fashioned jibs, which were constructed several years ago and intended to sustain but twenty-five tons dead weight. Fortunately a general overhauling and strengthening in recent years, combined with the addition of electric motive power for their operation, placed us in a position to feel no danger in attempting to undertake the work.

Our order called for five castings, which was afterwards increased to twelve, and an additional order for two of 80 inches diameter, same bore and stroke and practically the same design, made a total of fourteen. The pattern was of the skeleton type, leaving much to be swept up. The size of our oven determined to a very large extent the size of the bottom plate to be used, and we were on this account compelled to curtail the length of the lifting lugs rather more than



CORLISS LOW PRESSURE CYLINDER, MADE BY THE HARLAN & HOLLINGSWORTH CO., WILMINGTON, DEL.

we desired. This plate was, of course, cast in "open sand," and measured 11′ 2″ long and 9′ 2″ wide, having the lugs on the narrow side projecting 4 inches. It had a hole in the center about 60″ diameter, having also four lugs projecting internally from the periphery.

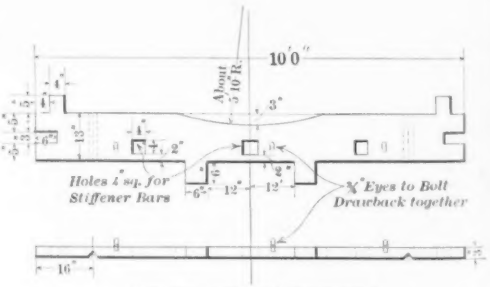


Bottom Plate of Mold.

In considering the construction of the mold and the strain it would be subject to during the pouring of the casting, we concluded to arrange for the use of vertical stiffener bars, secured at the bottom in a series of two lugs with square holes cored in them and held together at the top by means of bars with like cored holes to slip over them, running transversely. This helped to withstand the strain of pouring and also materially strengthened the mold during the operation of moving to and from the oven. For making the mold about 5,000 cherry salmon bricks were used and probably four tons of Millville gravel. The seat was first swept up on the bottom plate and the pattern then placed in position. The design of the cylinder made it necessary for us to split the mold at several points; the sides carrying the port cores were built upon two drawbacks, the joint being vertical with the mold; these drawbacks were in turn split horizontally across the center of the port openings. Several smaller drawbacks were required to cover the various nozzles and flanges. The inner portion of the mold was swept up in the usual manner and after reaching the top of the pattern the top plate (which was also an open sand casting, differing somewhat from the bottom one) was placed in position after having been loamed up. All joints were then carefully marked to insure their proper position when finally assembled, and the work of taking the mold apart and drawing the pattern was begun. After the pattern had been removed the mold was properly dressed and blackened and it was ready for drying.

In lifting the mold and carrying it to the oven carriage we used an oak beam, chains and stirrups. The latter were slipped over the lugs on the bottom plate, both on the outside of the plate and around the center hole, and were held in place by means of a pin running through the round core hole. The drawbacks had all been removed from the mold, and we calculated the weight to be about 38,000 pounds. The entire mold, drawbacks and top plate were placed in the oven and dried by a steady coal fire for 60 hours, during which period the center core was swept up. It was but a plain cylindrical core, having a 9-inch wall, and was built upon an open sand ring; the top was covered by a plate with an opening of about 35″ diameter; the upper counter bore was swept in this core.

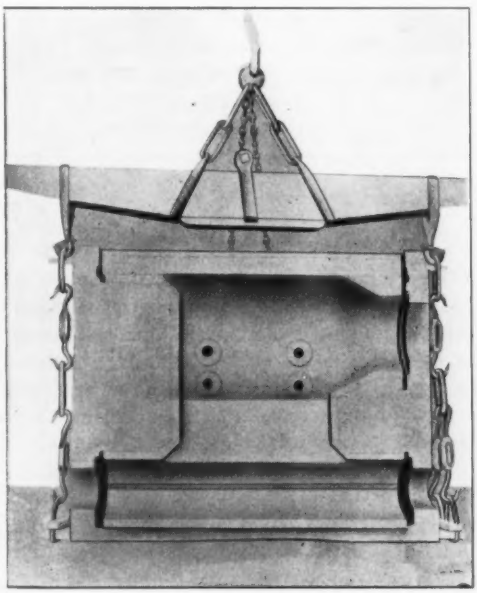
After drying the mold it was removed from the oven and lowered into the casting



Bottom Plate of Drawback

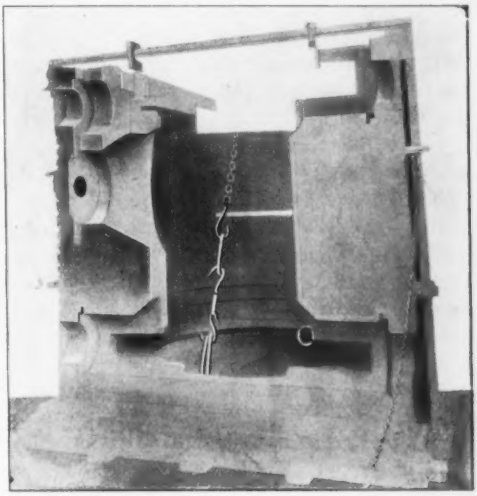
pit, which was a hole in the floor surrounded by good hard ground and about 14 by 17 feet by 8 feet deep. The port and other cores which had been made in boxes by the

core makers were also dried and ready for setting, and before placing the drawbacks in position the cores were set. In setting these cores we invariably found that we had to shave both the cores and mold to obtain the proper dimensions between centers, and also to retain the correct thickness of metal both above and below the cores. This we believe was caused by the expansion of the cast iron rods during drying, and could have been obviated by altering the pattern in accordance, but owing to the fact that the pattern did not belong to us, and the measurement of it, the prints and the core boxes being almost perfect, we allowed ourselves to incur this extra work. We had been told that others had made castings from the same pattern without complaint, and consequently allowed the matter to run on in the same manner each time. The cores that lightened the head were secured to the top plate, which was placed in position after the center core had been set. After closing, the mold was secured by means of heavy cross bars bolted down to place. At the bottom of the mold and about two feet from the walls we placed cast iron casings about 30 inches



DRAWBACK FOR CYLINDER MOLD.

high around the four sides, outside of which two vertical bars were placed on each side, being secured to the bottom plate by means of extension lugs having square holes into which the bars were placed—and secured to the top plate by means of the cross bars previously mentioned. The pit was rammed both inside and outside of this casing and up level with the floor, above which the



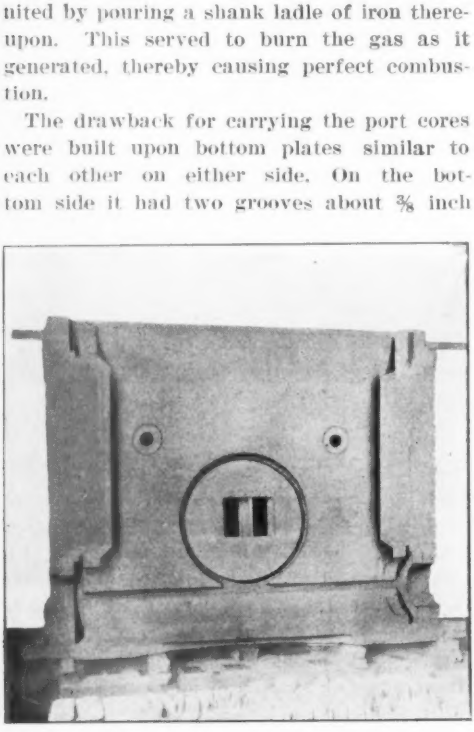
MAIN BODY OF CYLINDER MOLD.

mold extended about two feet. From the floor up another set of similar casings was used. The top and bottom plates were also tied together through the main core by means of a bar placed under the bottom plate over which stirrups had been slipped connected with the top plate by means of S hooks and eye bolts running through a bar extending across the hole in the top plate and securely bolted down to place.

The casting was done with three ladles—two of 20,000 and one of 15,000 pounds capacity—the latter serving one bottom runner and each of the others a top one, thus making three runners, two top and one bottom. The bottom had one gate six inches wide and one inch thick. These top gates were placed opposite to each other and between each set of cores, and delivered the iron as nearly as practicable directly upon the bore wall of the casting. In pouring, the ladle serving the bottom runner was first started and about 6,000 pounds allowed to flow from it before starting the others, which were emptied simultaneously; this was done for the purpose of protecting the bottom of the mold from probable injury which might be caused by the metal drop-

ping directly upon it from the top gate in an unhindered fall of about eight feet. The vents were made in the manner customarily employed in loam work, and owing to the liability of the center core to generate gas more quickly than an ordinary vent pipe would carry it off, a small runner was made on the top of the mold leading to the interior of the center core, in which some shavings had been placed, which were ignited by pouring a shank ladle of iron thereupon. This served to burn the gas as it generated, thereby causing perfect combustion.

The drawback for carrying the port cores were built upon bottom plates similar to each other on either side. On the bottom side it had two grooves about ⅜ inch



DRAWBACK FOR CYLINDER MOLD.

deep, on each end two lugs, and on the outside near each end one lug. The grooves served as bearings and guides for sliding the draw back into place after the cores had been set. The lugs on the ends served for lifting and also for means of blocking the chains in position during lifting to preserve the center of gravity, which of course changed after the cores were set. The lugs on the sides carried the weight of the cores by means of blocking built up to the extending ends of the core rods. Two square holes were also made in the plates for the purpose of serving as sockets for stiffener bars, which were built up in the wall. The cores were held back in place by means of hook bolts, which passed around the end of the core rod, being securely bolted at the back with nut and washer. They were also bolted back through four cored holes, shown in the illustration, chaplets being placed at various points to insure thickness and relieve undue strains.

From the bottom plate to the top stiffener of drawback, we also built in three bolts, which after being secured by nuts rendered the wall solid. On the bottom plate of the main mold at points corresponding to the grooves in the drawback plate, bars fitting the grooves were placed on which the drawbacks were moved into place. The adoption of a V-shaped groove with the use of a few balls would probably make this operation less laborious and more desirable, particularly should it be found necessary to move it more than once.

We had the pleasant experience of making six of the castings, each one of which proved to be faultless. In the production of the seventh, however, we were forced to see that the strain of lifting was too much for our building to stand with safety, and inasmuch as time was an important factor in their manufacture, we were reluctantly obliged to sub-let the contract to other good people who were better equipped for handling it than we. In closing I desire to say that all fixtures were designed and made by our foreman, Mr. Harry Fisher, and the credit of the success belongs to him and the efficient corps of workmen under his direction.

The Old and the New in Iron Making.

The rapid pace at which invention is crowding out former practices with development following close on the heels of decay is vividly illustrated at Dunbar, where a crumbling stone pile represents the first iron furnace built west of the Alleghenies, and a 300-ton modern furnace and a by-product coking plant, both owned by the Dunbar Furnace Company, represent the methods of to-day.

The Connellsville coking fields were unknown when the first blast, four tons of iron, was run from the old furnace. Charcoal was used for fuel. There was scarcely any roads in those days, and the ore was carried in baskets to the furnace, whilst the product had to be hauled 20 miles to the Monongahela river to be shipped down with the flow

of water to Pittsburg and other points. No wonder that the product represented $70 a ton: the profits were not then as considerable as they are to-day, when the same quality of iron can be purchased for $20 per ton. Not far from the historic spot the Dunbar Furnace Company's new 300-ton furnace will be supplied with stoves, hoists, self-hauling skips, blowing engines and the latest appliances for handling the product. It must have taken the builders of the original Fayette county furnace almost as much work to produce four tons of pig iron as it will to produce 300 tons under the new process.

The old Union furnace was built by Isaac Mason about the year 1789, and was first blown in in March, 1791. The first mention of the Union furnace is in the Fayette county court records for the June term of 1791, when there was presented a petition for a road from Union furnace to Dickinson's mill. The original furnace was a small concern and very crude in its mechanism. The iron ore, which was obtained from the surrounding mountains, was carried to the furnace in baskets, as was also the charcoal, and the iron was afterward hauled over the rough roads a distance of 20 miles to the Monongahela river, where it was shipped to the iron market of the world. It was about 109 years ago when this firm startled everybody by announcing that its furnace had put out in one day the enormous quantity of four tons of pig iron per day. This sold for $70 per ton.—Connellsville Courier.

Design and Shrinkage.

Mr. Roxburgh is in error in his remarks as to design in the August issue of THE FOUNDRY. Take his example Fig. 1. His pattern is 3 feet each way. Its diagonal is then $\sqrt{2(3)^2}=4.2426$ feet. The casting will be 2.97 feet each way; its diagonal will be consequently $\sqrt{2(2.97)^2}=4.2002$ ft. By shrinkage from its pattern length we find it 4.2426—.0424=4.2002 feet. Consequently there is no strain in the diagonal. This is supposing that all parts of the casting have cooled together. Shrinkage strains in castings of fairly uniform thickness are always caused by one part cooling before another. Anything in the design or in the handling which causes uneven cooling will also cause shrinkage strains; but there is no possible design in uniform thickness which renders shrinkage strains inevitable unless in some way it makes impossible such gating and manipulation of the mold as will insure simultaneous cooling of all the parts.

JOHN WILSON BROWN, JR.

Philadelphia.

Closing Cracks in Cast Iron Cylinders.

Cracks in cast iron cylinders may be closed in the following manner: The cylinder is filled with a certain quantity of perchloride of iron. The liquid is then compressed until globules appear on the external surface. The cylinder is then impregnated with perchloride of iron right through as regards its thickness. Any perchloride in the cylinder is then emptied out, the cylinder being then wiped until the polished surface is again made brilliant. It is then filled with ammonia at 22 degrees Baume, this also being subjected to compression. The effect of this operation is soon noticeable. The perchloride of iron in the metal becomes transformed under the influence of the ammonia into hydrated oxide of iron, at first somewhat frothy in character, and afterward, under the influence of the external pressure, rough and compact. Some hydrochlorate of ammonia also remains, which will soon afterward react on the iron, which will eventually be converted into an oxide compound, adding itself to the first. The leaks marked at the commencement of the operation will be entirely stopped as soon as the ammonia commences to move out externally.

(Will some one please give us the inventor's name. A cast iron medal awaits him.—Ed.)

Attaching Cogs of Gear Patterns.

All patternmakers are aware of how much work and time it takes to make wooden cogs and dovetail them into the rim of a gear-wheel pattern by the customary method, as shown in Fig. 1. This alone ought to be enough to condemn the practice, but there are further objections, one of which is that the feather-edged fillet left to form the clearance curve of the tooth will nine times out of ten break off, and thus weaken the tooth in the cast wheel. I have visited quite a number of shops and taken particular notice of the methods that are followed in attaching cogs to gear patterns. I notice that patternmakers generally dovetail the cog into

the rim, or if not, they merely curve the bottom of the tooth, to conform to the circumference of the blank and fasten it on with screws; but this method still leaves the feather-edge fillet.

By the dovetail method it takes one of our best and quickest patternmakers just two days—twenty hours—to make a bevel-wheel pattern of thirty-six cogs, 1½-inch pitch. This includes making the arms and putting in all that is necessary to make a complete pattern ready for the foundry.

By way of experiment, in order to prove the superiority of the method shown in Fig. 2, I had the patternmaker construct a similar wheel with the cogs attached, as there indicated. He made the wheel in sixteen hours, showing a gain of four hours, it being understood that the patternmaker was not informed that he was doing it as an experiment in time, nor ordered to hurry up. We have applied this method to wheels both bevel and spur, from fourteen cogs, 1¼-inch pitch, to 151 cogs, 2½-inch pitch, and have never had any trouble from loose cogs.

The drawing is self-explanatory, yet I will add a simple description of how the work is done. The blank is turned as usual, only instead of making the outside diameter equal to that at the root of the tooth, we usually give it a radius ¼ inch less. The circumference of the wheel is then marked off with as many spaces as there are to be cogs, and the outer surface between the points of division is flattened off (B), which operation is very simple and easily accomplished. The blocks from which the cogs are to be made are now built on the blank in the usual manner and the wheel put in the lathe and turned to its required diameter at the outside of the teeth, after which it is taken out and the teeth are laid out as usual. It will readily be seen that there is no difficulty in regard to feather-edge fillets or of the teeth coming out after having been secured to the rim by two screws. These screws are usually put in at the top on bevel pinions, but on spur gears and pinions having rims they can readily be put through the rim.

I have shown this method to several firms who have adopted it, which has encouraged me to present it here.—S. P. Y., in American Machinist.

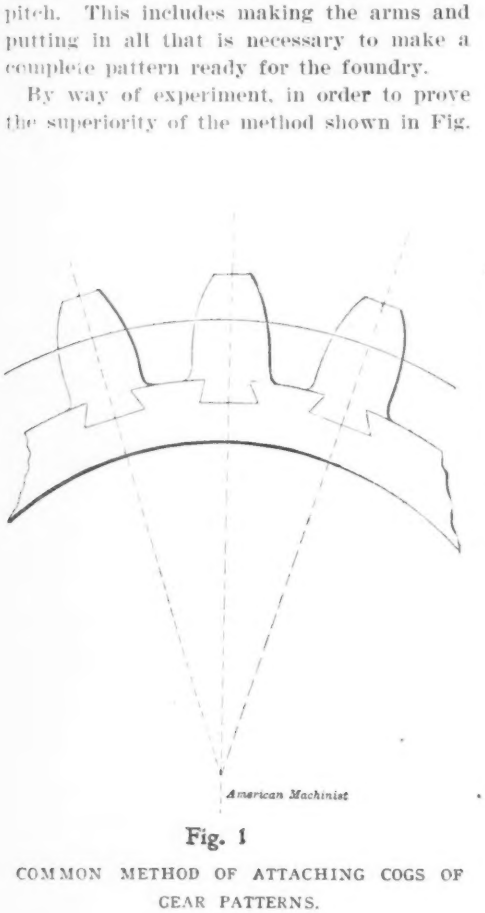


Fig. 1

COMMON METHOD OF ATTACHING COGS OF GEAR PATTERNS.

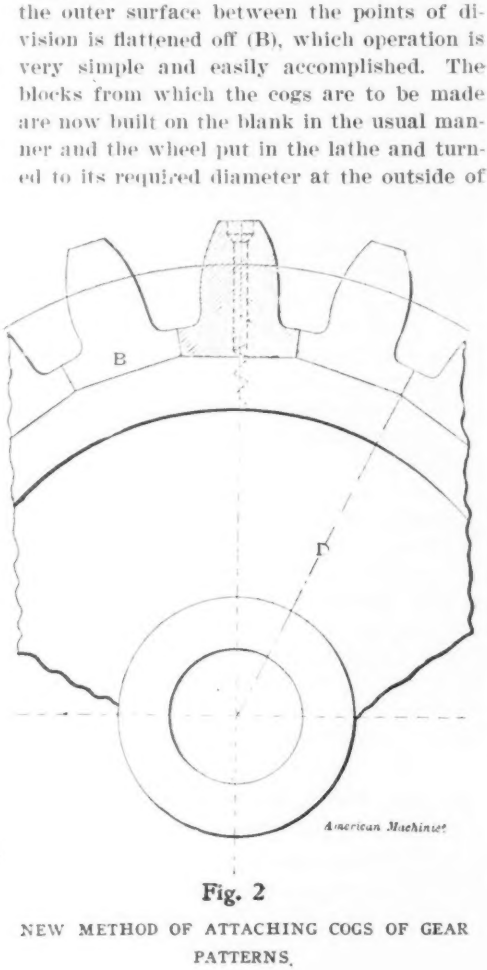


Fig. 2

NEW METHOD OF ATTACHING COGS OF GEAR PATTERNS.

Shrinkage and Blowholes.

I have read with interest Mr. N. W. Shed's article on the subject of "Shrinkage and Blowholes" in the May number of your journal, and, if not intruding, I should be glad to offer a few remarks on this important subject.

While not professing to be technically well up in the subject, my experience as a foundry foreman in this country (where we experience the same difficulty) may not be without interest.

Shrinkage, in the first place, may be caused by pouring the metal into the mold before it has been sufficiently cooled down; an operation which requires judgment, and depends very much on the nature of the metal you are using. The softer the iron, the more liquid it will be, and in consequence requires to be allowed to cool down a longer time. Another cause for the formation of shrinkholes is inequality of metal in the casting; holes being thus formed which are not visible, even after tooling. As regards the cure for this evil I have found it advantageous to run test pieces of the shape required in the casting, using for the purpose various brands of the best pig procurable, and thus find the most suitable brand for the purpose. As pig iron varies considerably in shrinkage according to the brand, my view is that one of the chief remedies lies in the selection of the best pig for the purpose.

As regards blowholes, the worst enemy with which we have to contend is, in my opinion, sulphur. This, of course, is found in varying proportion in different classes of pig, and particularly in some brands of cold blast. My view is that where you find these "sulphur bubbles" in a pig iron, it becomes gaseous on melting, and the sulphur gas being imprisoned in the molten metal, afterwards bursts through to the side, or surface, of the casting, where the blowholes (formed in consequence) are afterwards discovered.

Here again therefore, I consider that the selection of the pig iron to be used is the most important point to be considered; and it would be interesting to know whether any of your readers recommend the systematic testing of each batch of pig delivered for "shrinkage" and "sulphur."

The next factor of importance to be considered is, in my opinion, that of the furnace coke used. An inferior coke is in my experience a prolific cause of blowholes, very likely also owing to its containing an excess of sulphur. The remedy here is to use only a high class grade, bright in color, close grained and hard.

Many practical men in this country in my opinion waste a lot of time by employing large heads, feeders and risers in endeavoring to get over the difficulty; often by these means getting worse results than they would otherwise do. My view, as I have endeavored to show, is that the pig used is at the bottom of the whole matter, and, if this question is discussed further in your valuable journal I shall be greatly interested in reading any views which may be expressed.

A. W. PEARSON.

Lincoln, England.

Foundry Chemists.

It is not surprising that a difference of opinion should exist among foundrymen regarding the value of the services of the foundry chemist. This is due to the fact that many of the chemists who have been employed by foundrymen are not familiar with the line of work which they have undertaken. This applies particularly to young men from our technical schools without practical training under an expert foundry chemist, and metallurgist.

The majority of the graduates of our technical schools possess only a rudimentary knowledge of applied chemistry and know nothing of practical metallurgy as applied in the mixing and melting of iron. Consequently the foundryman who employs such help derives very often but little benefit, and under such circumstances it would seem better for him to contract with an expert of known ability to keep him straight regarding mixtures, analyses, etc. There is a demand for competent foundry chemists and metallurgists which should be met by our schools in affording better opportunities for thorough education in this line of work, and this can only be done by employing competent men as instructors, who know the needs of the foundrymen and who have learned from experience what they are to teach. The graduates of such institutions, provided they have passed the necessary examination to entitle them to a diploma, would then rank with the young man who has obtained his technical education in the works laboratory

and the foundry under the teaching of a successful practical metallurgist and chemist.

Few graduates of technical schools come to the manufacturer with services to sell which are of much value in the beginning. They lack the "hospital practice" required of young physicians and surgeons before they are allowed to practice on the public. They also lack the opportunities enjoyed by the medical student of hearing lectures and seeing demonstrations by the foremost men in the profession. Why should not the young chemist be required to get his "hospital practice" also before he is turned loose as well as the young physician? What the foundryman needs is not only the services of a chemist but a metallurgist as well, that is, a man who knows how to mix and melt iron to the best advantage and at the lowest cost consistent with good quality of product. The chemist alone is of no more use to the foundryman than the druggist alone is to the sick man without the physician to prescribe how the druggist's medicine is to be taken.

The chemist should possess the required knowledge and skill to make his determinations accurately and quickly, and the metallurgist should know how to make use of the chemist's results. The chemist and metallurgist should be combined in one. It seems to be difficult for a young man seeking the career of foundry chemist and metallurgist to find the necessary instruction in our technical schools. This is a conclusion which we have been compelled to draw from experience. It is to be hoped that it will not continue to be so.

The enterprising and thorough Germans are alive to the necessity of more thorough technical education for their young men, for we find in the proceedings of the German Iron and Steel Institute, held at Duesseldorf, June 17th, an announcement that the Royal Technical High School, of Berlin, is about to require one year's work in an industrial plant following the course in the high school as a condition for final examination and granting of a degree, and the matter was brought before the Institute asking for its co-operation in aiding the young men who were aspirants for such degrees, to obtain admission into the works where they could get the practical experience required. Ia was also announced that a chair was to be endowed at the Royal High School to be filled by a practical, as well as theoretical expert, in the mechanical department of metallurgy.

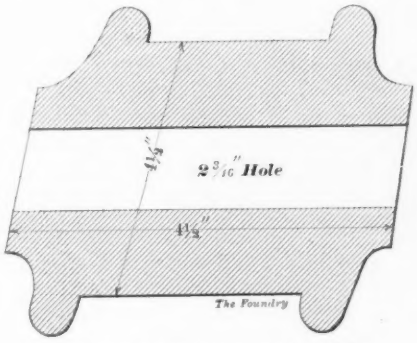
It will be seen, therefore, that in this age of keen competition and specializing of knowledge, the fact is being recognized that the technical school must keep up with the procession, and must turn out trained men and not raw recruits.

CHARLES H. VANNIER.

Necessity is the Mother of Invention.

The O'Rourke & Safely Co. recently took an order for a thousand grooved wheels in which the hub had to be cored with a 2 3-16 inch steel core to save machine work. At first we tried a patent coating which gave very good satisfaction although we found that we had to dip the steel cores four times in order to have them leave the casting freely.

One day we ran out of the patent coating and force of circumstances more than anything else made me resort to a substitute,



HUB CORED WITH STEEL CORES.

which I found to work far better than the patented article at about half the cost. I used shellac varnish, cut with wood alcohol, and added plumbago core wash, which latter was stirred in until the mixture was thick enough to dip good and leave a thin coat. This would dry in a few minutes when I would dip the steel core a second time and it was then ready for use and would leave the casting easily. The attached sketch shows the principal dimensions.

I found that this shellac and plumbago coating can be as readily tooled as if a sand core had been used.

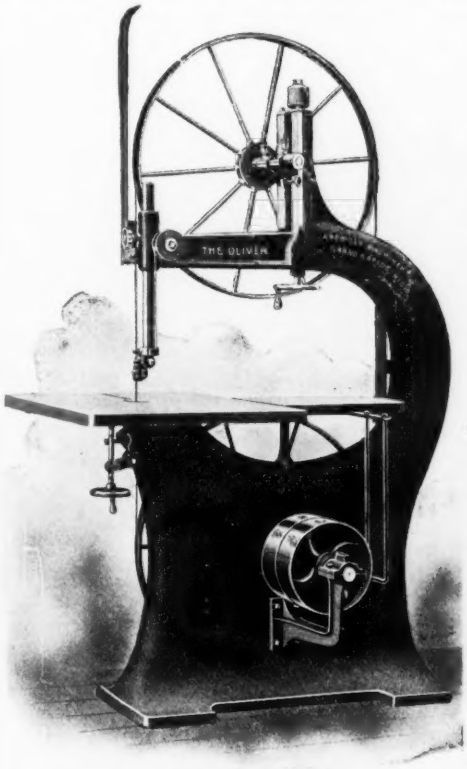
W. H. FONDA.

New Orleans, La.

The Oliver Band Saw.

We illustrate herewith the Oliver band saw, in which a sufficient quantity of metal is used to insure a very substantial and rigid construction in the frame. It is cast in one piece, and is of a cored-out pattern, thus giving the greatest strength in proportion to the weight.

The wheels are one of the strong points of superiority in this machine. They are 36 inches in diameter. Forged steel rims with



THE OLIVER BAND SAW.

steel spokes are used, making a light yet rigid wheel. A very large proportion of the weight is in the cast iron hub. This weight being in the center does not exert the centrifugal force which would be the case if in the rim or spokes. Owing to the peculiar construction of the hub, the path of the saw is directly over the bearing, thus doing away with the over-hanging strain otherwise present. Motion is also imparted to the upper wheel with less strain on the saw, which makes it possible to use the lightest saws without liability of breakage, and at the same time they are rigid and strong enough to handle heavy saws with the utmost ease and safety. The two-inch face of the wheel is covered with a superior quality of rubber bands, which after being securely cemented to the rim, is accurately ground and the wheel balanced.

The table is 3 inches by 30 inches in size and it is a well-ribbed, heavy casting, which is carefully planed to an absolutely true surface. The tilting device on the "Oliver" will readily appeal to any mechanic. It is possible to have a perfectly rigid table at any desired pitch, and when it is desired to change this pitch it is unnecessary to loosen any screws or clamps. All that is necessary is to commence turning the handwheel. The table is perfectly rigid in whatever position it may be left. The only way to move it is to turn the hand-wheel, which operates very easily. A stationary table is furnished, if desired, at a slightly reduced cost, but the perfection of this tilting device makes it worth, in the estimation of most people, far more than the slight difference in price.

These machines are built in either right or left hand. In many classes of work it is found exceedingly convenient to have a right and left hand saw stand side by side so that work can be handled from between them. The American Machinery Company, of Grand Rapids, Mich., are the manufacturers.

The Allis Mutual Aid and Ambulance.

In 1883 there was a general "house warming" in the carpenter shop belonging to the E. P. Allis Co., of Milwaukee, and after all bills were paid there was a balance of $65.10 which was handed over to Mr. Allis by the committee in charge. Mr. Allis returned the money, stating that it belonged to the men, and when it was then suggested to use it as a nucleus for the establishment of a mutual aid society the idea greatly pleased Mr. Allis.

An initiation fee of 50 cents and monthly dues of 25 cents was charged, and when the society had been in existence but a short time Mr. Allis sent for the committee to give him a statement of what had been done and what were the prospects of success with the society. At that time he agreed to duplicate all dues paid into the society by its members and this liberal policy inaugurated by Mr. Allis did not cease with his death but has been continued every year by the E. P. Allis Co.

The initial year of the society registered 533 members, which has now grown to about 1,250. Since the origin of the society there has been paid for sick and accident benefits the sum of $40,778.82 and for death benefits $8,096.50, or a total of $48,875.32. Besides these benefits the society furnishes a doctor and free medicines which have cost the additional sum of $11,926.14, and other expenses of $3,083.14, making a total of disbursements by the society of $63,884.70 and leaving a balance on hand of $6,000.

The society has always endeavored to secure the services of the best physician that could be procured and a little over a year ago was fortunate in securing the services of Dr. Thomas Lucas, who is a thorough, progressive physician, who conceived the idea of establishing an ambulance corps in connection with the mutual aid society, for in many cases when there was any slight accident in the works the men would usually take a piece of tobacco, place it over the wound, wrap it up and go back to work and expect to have an instant cure, but the reverse was the case, as they had impregnated the wound with myriads of germs of disease and in many cases caused blood poisoning and in order to get over this trouble Dr. Lucas organized the ambulance corps, which is composed of 30 employes of the various departments in the establishment, who at the formation of the corps received weekly lectures from the doctor on the "First aid to the Injured." These lectures are now given every two weeks. In every department there is a box containing all the necessary requirements in first aid and should at any time a serious accident occur the patient is put upon a stretcher and carried into the hospital, which has been fitted with an operating table and the most improved equipment in ambulance work, and every day the doctor is in this room during noon hour to

give medical advice and medicine to the sick members of the aid society. Adjoining the operating room is the ward with two beds. There is also a janitor (who is a member of the corps) to keep the place clean and heated to a regular temperature and attend the patient, and if the latter wishes to go home there is an ambulance wagon of the most modern style ready for use at any time. Each member of the corps is supplied with a book on the "First Aid to the Injured," so that he may at leisure study and acquaint himself more thoroughly with the duties he has undertaken.

The expenses of the entire outfit and the maintaining of the same, together with the cost of the lecture room, hospital, etc., has been the voluntary gift of the E. P. Allis Co. and is greatly appreciated by all and some of the workers have even undergone operations in the "Allis Hospital" in preference to going to a public hospital.

The most of the members of the corps have now passed the examination of the "Red Cross Society" and received diplomas and badges. These members are now organizing a red cross society in this city and are endeavoring to have all the large establishments send representatives, also the police and fire departments, to get trained in ambulance work, so that, if an accident should occur in the street there will be intelligent aid rendered at once to the injured.

EDWARD B. GILMOUR.

Deaths.

Charles Stott, an old time foundryman at New Iberia, La., is dead, aged 66.

J. F. Fosmir, a pioneer foundryman of Los Angeles, Calif., died there July 24, aged 67.

James Hemphill, of Mackintosh, Hemphill & Co., Pittsburg, died in that city recently, aged 73.

Dwight R. Wing, a pioneer foundryman of Little Rock, Ark., passed away July 29, aged 65.

John Bowden, who started the Freehold, N. J., foundry in 1856, died in that city recently, aged 73.

John H. Ricketson, president of the A. Garrison Foundry Co., died at Pittsburg recently aged 63.

The stove trade will learn with regret of the passing away of a leading figure in the stove world half a century ago, in the death of John Abendroth of Abendroth Bros., the well-known Port Chester, N. Y., stove founders. He was born in Germany in 1825, and while yet in his teens came to this country. In 1845, with his brothers, William P. and Augustus, he formed the firm of Abendroth Bros., withdrawing from same in 1874.

Personal.

John Maher has been appointed foreman of the Connell & Dengler Machine Co's. foundry at Rochester, N. Y.

J. K. Bougher, president of the J. W. Paxson Co., Philadelphia, is making a combined business and pleasure trip through the continent of Europe.

Frank M. Henry has resigned as superintendent of the foundry department of the North & Judd Mnfg. Co., New Britain, Conn., a position which he has filled successfully for a number of years. J. L. Murphy, formerly with the Naugatuck Malleable Works, will succeed him.

The Peninsular Iron Co., of Detroit, Mich., producer of Lake Superior charcoal pig iron, has made an arrangement with Rogers, Brown & Co. for the sale of its product in all markets. The latter company has also been appointed sole selling agents for the output of the Allegheny Furnace located at Iron Gate, Va. The furnace is out for repairs, but is expected to blow in on October 1st.

The International Correspondence Schools, Scranton, Pa., have solicited and contracted with Mr. Thos. D. West, to write a series of instruction papers for them on the principles involved in green sand, dry sand and loam molding, also on mixing irons by analyses and the management of cupolas. The work is now more than half completed and the papers will probably be ready for distribution by the Schools this coming fall.

The Chicago Pneumatic Tool Company has engaged Fred F. Bennett as sales agent and manager of advertising, with headquarters at the main office of the company, Monadnock block, Chicago. Mr. Bennett resigned a position as sales agent for the American Steel Casting Company, and American Coupler Company of Chester, Pa., the change taking effect July 1. His apprenticeship of several years was served on the Chicago daily papers as reporter and city editor, and later he was city editor of the Omaha Re-

publican. Subsequent to this he was for many years western representative of the Railroad Gazette, of New York.

The Paxson-Brown Oil Furnace for Melting Brass.

Where crude oil is obtainable at a low cost, as it is in many of the great manufacturing centers of the United States, this fuel is one of the most convenient to use for many operations. In fact where uniformity of temperature is desired it is doubtful if anything else will give the same results.

With crude oil all expense ceases when the supply is shut off, in fact there can be but little waste. Besides there are no ashes to be removed and carted away. Several experiments have been made to utilize this fuel in brass furnaces with more or less success. We illustrate herewith a new design of an oil furnace for melting brass and copper which is known as the Paxson-Brown Oil Furnace, and is manufactured by the J. W. Paxson Company, of Philadelphia, Pa.

Fig. 1 shows the Paxson-Brown furnace, which during the melting operation is supported on trunnions. Everything being above the floor level it may be readily examined. In case any metal should be spilled, it will not be partly lost in the ashes as with the ordinary form of furnace construction.

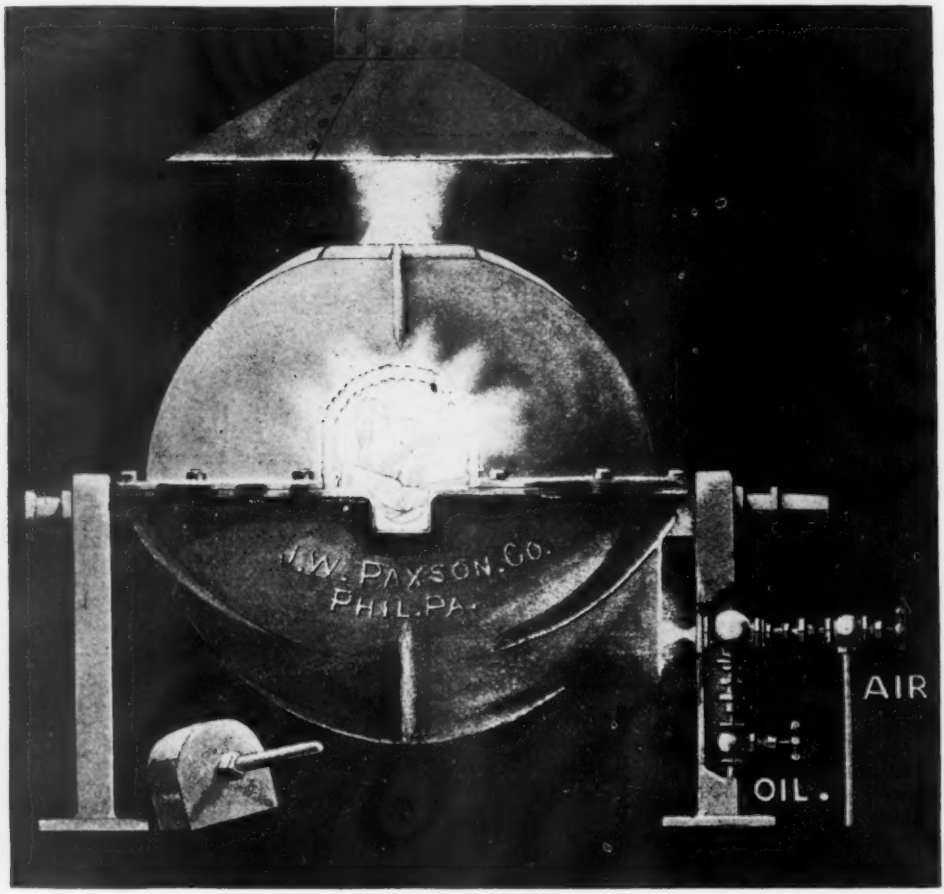


FIG. 1

After the metal is melted the furnace may be lifted from the trunnions by any kind of a hoist and the metal poured directly into the molds as in Fig. 2, or the furnace can be emptied into crucibles or ladles and poured therefrom. One of these furnaces

has been tried at the brass foundry of the Cramp & Sons Ship and Engine Building Co., of Philadelphia, where it has been ascertained that the loss from oxidation is much smaller than with ordinary furnaces being but 1.3 per cent. At a trial it was found that the cost of melting 530 pounds of metal was but 64 cents. The furnace shown in the illustration has a capacity of 250 pounds of metal at a heat and the Paxson Co. are now building one of 2,000 pounds capacity for the Cramps' brass foundry.

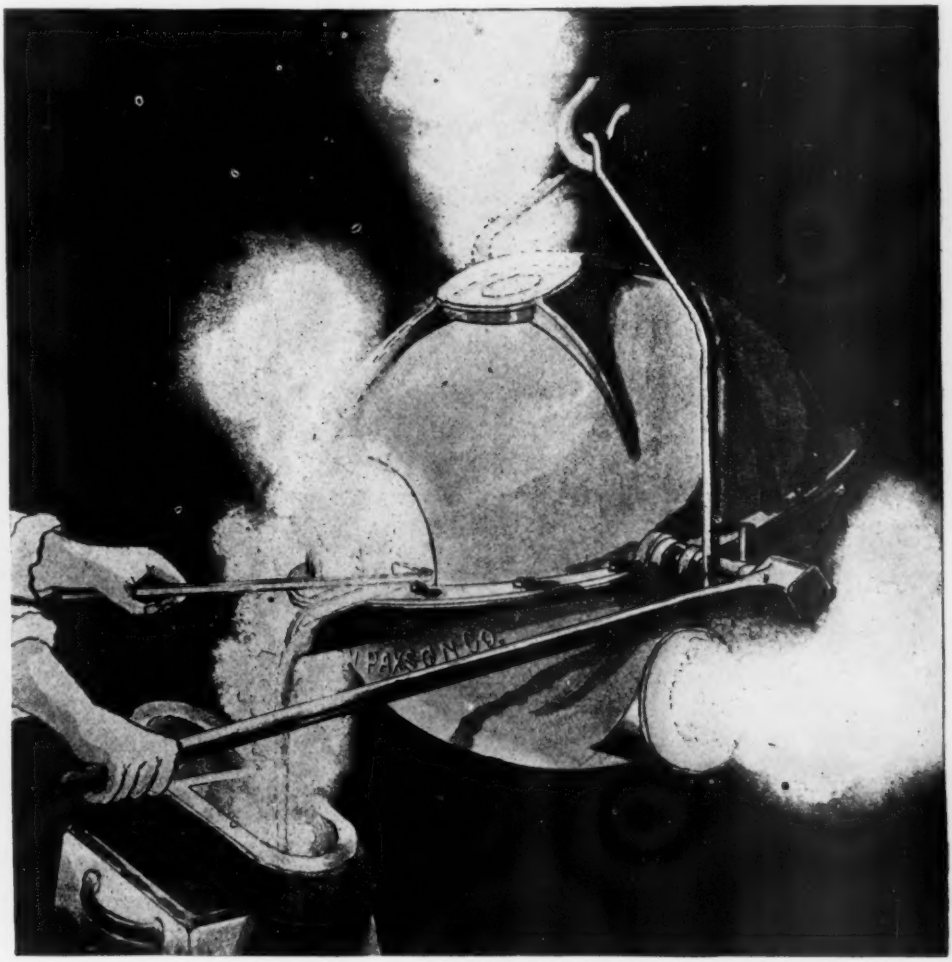


FIG. 2

As the crucibles used in these furnaces do not have to be handled with tongs nor subjected to continual changes of temperature through being removed from the furnace it follows that these will last a much longer time than where such conditions prevail. The J. W. Paxson Co. have applied for patents on this furnace as well as three other styles for melting brass with oil. As soon as these are completed we will give our readers some further information concerning same.

The Flux Fake.

In the August number of THE FOUNDRY a fac simile of the circular of the Flux Fakirs was printed and the worthlessness of the so-called nickel manganese calcium fluoride was mentioned.

The exposure of this fraud is most timely, for persistent attempts have been made to foist this article on the foundries. The "nerve" of the promoters comes out when

the real nature of the stuff is known, for the product is nothing more or less than blast furnace cinder, the slag of the charcoal furnace. The following analysis shows this:

Oxide of iron	12.86%
Oxide of manganese	.23%
Alumina	10.30%
Lime calcium oxide	22.50%
Magnesia	2.03%
Sulphur	.16%
Phosphorus	traces
Alkalies	.65%
Silica	51.10%

The little shots of pig iron scattered through the lumps of slag also show its nature.

A mixture closely resembling this flux can be made by using cupola cinder mixed with molding sand. This would have as much effect as the flux if used as a purifier of metal, and those who would like to follow the directions of the fakir might add the given number of pounds of sand and cinder and expect to get all the results of clean metal, freedom from blowholes, density, strength and fluidity that are supposed to come from the more advertised flux. Better than making an artificial mixture would be the plan of going to some old charcoal furnace dump and picking up the bright colored lumps of slag. This would save freight from Durango, Mexico, where the same thing is carefully packed in canvas bags.

The old trick of using a scientific name to cover a worthless article is played in this case.

A part of the name can be found in the analysis. The iron is there, the lime gives the calcium, the manganese is present in minute quantity, only sufficient to color the slag. But where is the nickel and the fluorine? Not a trace of them can be discovered, but the name fluoride is put on so that the unsuspecting may think that some of the properties of fluor-spar as a flux are hidden in the compound.

Perhaps a little scientific jargon, for the name is ridiculous, may be pardoned, but the public should be protected from those who in the name of science palm off dirt as a purifier.

Philadelphia. N. W. SHED.

It does not appear to-day as if there was a scarcity of pig iron.

CAST IRON NOTES.

Devoted to inquiries from Practical Foundrymen on the subject of Melting and using Cast Iron. Address all inquiries to W. J. KEEP, care of The Foundry.

Silicon in Iron.

First Question: Suppose a melt is composed of half pig iron, in which the silicon is 3% and half scrap from the day before, and that mixture is continued daily, what is the percentage of silicon in the castings, and how do you arrive at the correct answer?

Second Question: Suppose the iron is abundantly hot in the ladle, and contains 3% silicon, what is the probable cause of its being sluggish when pouring?

Answer: The exact percentage of silicon in the casting is of little importance and would do you little good if you knew.

It is the effect that you want. All the good the silicon can do is to change carbon into graphite. The scrap from the day before has less carbon than the pig and less silicon also.

Probably the silicon in the scrap would be 2.75 or 2.80 per cent, and if the pig mixture gave 3.25 carbon the scrap would have near 3%. The less carbon the more silicon is required to produce a given effect.

The life and fluid running of iron depends upon the amount of graphite it will contain when cold.

Iron deficient in carbon will run sluggish when poured, although it appears hot when caught in a ladle.

With carbon 3.50%, 3% silicon would make the iron very fluid when poured if it was not carried too far, but with half the mixture returned the carbon would run down and more silicon would be required.

The measure of the result is the shrinkage of a test bar.

Never mind the percentages but keep the shrinkage uniform and the quality will be satisfactory.

Yet it is a fact that low carbon is undesirable and that such iron cannot be made to run as it should.

This is the problem that meets us all just now. The furnaces are being run so fast to get a large output that too little time is allowed for the iron to pick up sufficient carbon.

The iron is close grained and the broker endeavors to prove to the founder that so long as the silicon is there it does not mat-

ter what the appearance of the fracture is, but this is a mistake. If the fracture is not satisfactory, there is something lacking and it is probably carbon.

Iron with a good fracture occasionally lacks silicon and the good fracture is the result of high carbon and favorable conditions.

Iron with a bad fracture with sufficient silicon is never as good as with a good fracture.

In your case you will have to look around for an iron higher in carbon.

Your shrinkage test will show the influence of silicon in presence of all conditions, and is a perfectly safe guide.

Match Boards.

Question: When there are only 40 or 50 pieces to make what is the best material to use?

Answer: The ordinary method is to make a sand match, but a much better way is to nail around the edge of a follow board a strip deep enough to reach the average parting line of the pattern. Then fill the space around the pattern with clay mixed as stiff as it can be worked. Mold this so as to support the pattern and make all parting lines.

When you are through with it, take the pattern out and place the match in a damp place, so as to have it always ready for use.

This is the best follow board that can be made. If at any time the parting line is injured, a pressure of the finger restores it. It is a question whether for all work that does not run steady this board is not better than an oil sand match or one made of plaster.

Good Iron for Stove Plate.

Question: I would like very much if you will inform me how to mix different brands of pig iron to get the best mixture for stove castings.

Answer: Purchase good open grained pig iron. Ask the one you purchase of to tell you how much silicon it contains. As you need nearly 3% of silicon in good stove plate iron, you ought to have some good silicon iron in your yard. When you know from the dealer the silicon in your pig iron and the quantity in the silicon iron, you can calculate how much of each to use to get 3% in the casting. Read what I have said in answering the first question above.

The Cleveland Molders' Strike.

Th strike inaugurated by the Iron Molders' Union in fourteen of the leading foundries in the city of Cleveland to enforce a demand for an increase of 25 cents a day, which was afterwards modified to a demand for an increase of ten cents a day, in the rate of wages paid in that city is still being conducted by the molders without any apparent diminution of the energy they displayed during the earlier weeks.

The only change worthy of note that has taken place consists of the decision of practically all of the foundrymen to replace the strikers with other men, and as nearly all the shops affected are affiliated with the National Founders' Association, the latter organization has been compelled to espouse the cause of the Cleveland founders.

This has been done in three ways in harmony with the By-Laws.

First—Supplying the founders affected with castings.

Second—Supplying them with molders to take the places of the strikers.

Third—Compensating the founders affected for such loss as they are put to by reason of the temporary closing down of their business.

No great difficulty has been encountered in the matter of having Cleveland patterns handled by members of the association outside of Cleveland, other founders doing a line of light gray iron work in the city to the number of eight or nine were all of them very anxious to aid their fellow foundrymen, and have done everything possible to assist by making such work as they are fitted for.

In the matter of procuring men, very satisfactory progress is being made; much more so, in fact, than was reasonably anticipated, and there are at the present time 130 men at work.

Ordinarily in matters of this kind it has been a common experience that the class of men secured to fill the places of the strikers have proven to be very much below the standard in point of workmanship, and it is a pleasant surprise to note that the exception has been the case in Cleveland, and mechanics of a very superior class have been coming to the city and helping to fill the shops.

This has, of course, been very largely

brought about as the result of the efforts of members of the N. F. A. elsewhere, many of whom have been instrumental in sending first-class men able to do any class of work.

Then again, the inducements offered have been somewhat different from the usual ones, and have been unusually effective.

In the first place, the foundrymen have agreed to pay $2.75 and upwards for competent floor molders and $2.50 and upwards for bench molders.

In addition to this the National Founders' Association are paying to each man who goes to work an extra compensation in the way of a bonus of $2 per day, said bonus being guaranteed until October 1st, with the prospect that it may continue for a longer time in whole or in part.

But the greatest inducement of all would seem to be the promise given to those molders coming to work under present conditions and remaining a certain length of time that they shall receive a card issued by the N. F. A., under such rules as the association may make, which will practically assure the holder permanent employment, as members of the National Founders' Association will be in duty bound to honor it at all times.

A very large percentage of the molders now at work in Cleveland realize the growing strength of the N. F. A., and foresee what the possession of such a card will mean; and they stand a very good show, judging from the present prospect, of having their expectations fully realized.

If the present plans of the officers of the National Founders' Association, as referred to from time to time at the conventions of the association and in the columns of the trade press, are fully carried out, there is quite likely to ensue a radical departure from old-time methods in the employment of molders hereafter, in which a card issued by the molder's last employer may be a prominent factor.

In addition to the foregoing a contract is given to each molder going to work in Cleveland in which all the foregoing is clearly specified and the holder guaranteed steady employment in the shop making the contract.

Several of the foundries are already as full of men as they care to be, and have all the molders they can use, and the work of filling up the balance is progressing steadily.

There would seem to be, however, a very general idea that the real cause of the strike has been greatly misunderstood upon the part of the employees, and in order to satisfy themselves upon that point The Fulton Foundry Co. addressed a letter to the secretary of the association, which the latter referred to H. W. Hoyt, of the Gates Iron Works, Chicago, who is vice-president of the organization, and who was also chairman of the Cincinnati conference which considered the wage demand of the various cities involved at that time.

This correspondence will be found to be of general interest, and is as follows:

Cleveland, O., Aug. 7, 1900.

John A. Penton, Sec. N. F. A.,
Hollenden Hotel,
Dear Sir: Cleveland, O.

In conversation at various times with a number of the molders formerly in our employ before the commencement of the present labor difficulties in this city, we have been impressed very much upon each occasion with the apparent lack of accurate knowledge possessed by them as to the real causes of the present difficulty. A number of statements are made by them that are entirely erroneous, and no two of them seem to agree as to the exact condition of affairs. It seems to us, therefore, that it would be a good plan to have such steps taken as would place the matter clearly before the molders of Cleveland, as some of them are already declaring that they have been deceived as to the real issue. We have heard it stated that the strike was brought about by the attempt of the employers to reduce wages; that it was caused by the refusal of the employers to pay the same rate of wages as paid last year; that the employers desired to disrupt the local union in the city of Cleveland; that this was a carefully-devised plan to disunionize the shops, and that the employers all over the country had joined with the foundrymen of Cleveland to injure their union. Inasmuch as they have themselves forced this issue, and have brought it about much against the wishes of their employers, we cannot see how any of these statements can be true, and we think it might be a good plan to have such steps taken as would place the exact facts before the molders of Cleveland.

Yours most sincerely,

FULTON FOUNDRY CO.
Per C. J. Langdon.

Cleveland, August 8, 1900.

Mr. H. W. Hoyt, V. P. N. F. A.,
Gates Iron Works,
Chicago.

Dear Sir:

Enclosed please find letter just to hand from the Fulton Foundry Co., of Cleveland, O.

You will notice that they seem to desire to have some definite information from an authentic source as to the exact causes that have led up to the present difficulty between the foundry proprietors and their molders in Cleveland.

It seems to me that as chairman of the Cincinnati Conference Committee, and as one of the members of a committee who met the officers of the Iron Molders' Union in Cincinnati, that you would be naturally the proper one to answer this communication, and I therefore hand it over to you for such disposition as you may see fit.

Yours very truly,

JOHN A. PENTON,
Sec. N. F. A.

Chicago, August 9, 1900.

Fulton Foundry Company,
Cleveland, Ohio.

Gentlemen:

Your letter, under date of August 7th, addressed to the secretary of the National Founders' Association, states that some of the molders who are now out on strike in Cleveland claim they are fighting against an attempt on the part of the foundrymen to reduce wages below those paid last year, and for the further reason that there is a deep-laid scheme to disrupt Cleveland Union, No. 218.

In the hope that a recital of the facts in relation to this matter may serve the mutual interest of employer and employee by showing the absolute falsity of both of the above stated causes for the strike, I beg to submit the following facts relating to the history of the present wage controversy in Cleveland:

A conference was held in Cincinnati May 1, 1900, between the representatives of the Iron Molders' Union of North America and the N. F. A., to consider the demands of the molders in the cities of Cincinnati, Cleveland and Chicago. The members of this conference had been duly appointed by the chief executives of the two associations and were charged with the duty of attempting to harmonize the conflicting views regarding the question of wages. Previous to the meeting of this conference committee a conference had been held in each of the three cities of Cincinnati, Cleveland and Chicago between the duly accredited representatives of the two associations named, for the purpose of settling the demands made by the local unions of the I. M. U. of N. A. in each of those cities.

The three local conferences thus held had succeeded in agreeing upon certain points, but in each case there was a failure to agree upon the question of wages, and by general consent it was further agreed that the question of wages should be referred to still another conference, which conference should attempt to legislate for the three cities.

In each of the three cities named the molders had made a demand for an increase over the 1899 scale of from 25 to 50 cents per day, and in each case the representatives of the N. F. A. had maintained that the condition of business did not warrant any increase whatever. Under the New York agreement, however, the molders kept at work, pending the final decision of the matter, and an attempt was made to settle the question at the Cincinnati conference.

The Cincinnati conference was composed of seven representatives from the I. M. U. of N. A. and seven from the N. F. A. There were also present at the conference the president, vice-president and executive board of the I. M. U., as well as a number of business agents from different cities. Each one of these gentlemen was accorded the privilege of presenting his views.

The demand made by the molders was for an advance of the minimum wage in force in all the cities from May 1, 1899, to May 1, 1900. In Chicago the increase demanded was 50 cents per day for bench molders and 25 cents per day for floor molders. In Cincinnati and Cleveland the demand was for an advance of 25 cents per day for both classes of molders.

I take the following extract from a report of this conference printed in the Journal of Iron Molders' Union of N. A.:

"In the discussion which took place the foundrymen laid particular stress upon the fact that recent developments in the iron

market had injected such an element of uncertainty into the future that they hesitated about contracting for labor at a higher price until they could see more clearly what was in store for them. They contended strongly against what seemed to them an injustice in placing a differential against large centers as compared with provincial towns. The latter argument was vigorously opposed by our representatives, but they were compelled to admit the existence of disturbing elements in the industrial world in the shape of Wall street manipulations, and far-reaching labor troubles both in progress and in prospect. The foundrymen suggested that final adjustment of the wage question be eferred until July 1st next, and that meantime the molders continue to work at the present rate. The molders' representatives were willing to agree to postponement of final adjustment, but suggested that the demands made by the molders in the several localities be conceded in the interim. After a lengthy discussion, during which it seemed as if no agreement would be reached, the foundrymen receded from their original proposition by offering an advance of 10 cents per day until July 1st, with the understanding that the demands of the molders would be again taken up before that date."

After a full discussion, lasting nearly one-half a day, the following resolution was finally unanimously adopted:

"Resolved, That this conference recommend the continuance of the present scale of wages in the cities named until July 1st next, with 10 cents per day added to all bench, floor and piece work molders.

"That when this conference adjourns it shall be to a date between the first and fifteenth day of June next, as may be arranged between the national officers of said associations.

"That when this conference reconvenes it shall take up the matters in question with a view to making a satisfactory settlement for such period as may be found desirable.

Provided, however, It shall be understood that no action of this adjourned conference meeting shall be taken which will reduce the present minimum rate of wages on all bench, floor and piece work below the standard now prevailing, during the year from July 1, 1900, to July 1, 1901."

In closing its report of this conference the Iron Molders' Journal says:

"On motion this resolution was unanimously adopted and stands as the temporary settlement of the wage question in Cleveland, Chicago and Cincinnati and vicinity.

"We are fully alive to the fact that many of our members, especially in Cleveland, will feel dissatisfied at the result, but they must remember that events have so shaped themselves that isolated action was not feasible, the question having taken a broader and more comprehensive range, not through any action of the Iron Molders' Union, but as a result of the organization of the foundrymen of the country. After the first disappointment is over we feel our members will indorse the action of the executive board in this matter, especially as, if trade uncertainties have been removed two months hence, their demands will again come up for consideration without prejudice."

It will be seen from the above resolution and by the report made in the Iron Molders' Journal that the Cincinnati conference simply agreed upon a temporary advance of 10 cents per day during the months of May and June only, with the understanding that the future conference should again take up the question with a view of settling upon a policy, it being generally believed that the business conditions of the country would be more settled in the course of six or eight weeks.

Consequently another conference was held in Detroit, the whole matter was thoroughly discussed again, and it appearing from the foundrymen's point of view that the conditions of trade had grown worse instead of better, they declined to grant any advance of wages over those prevailing in 1899, and proposed the 1899 rates as a basis for the year beginning July 1, 1900, and ending June 30, 1901. The molders refused to accept this proposition, and no agreement was reached on the subject.

On July 1st the foundrymen in the cities of Cincinnati, Cleveland and Chicago notified their employees that the scale of 1899 would be paid. These terms were accepted by the molders in Cincinnati and Chicago, but in Cleveland the molders made a demand for $3 per day, or 25 cents per day advance, and on being refused went out on strike.

It will be observed that there has been no attempt in any of the cities mentioned to reduce the wages of 1899, although the business conditions are confessedly far less prosperous than they were during the year 1898. The ten cents per day granted for May and June was purely a temporary matter as the resolution shows and as the Iron Molders' Journal faithfully reports. It was thoroughly understood by all parties at the Cincinnati conference that the whole question was to be taken up anew, without any regard whatever to the temporary advance, which was simply made in the interest of harmony and without prejudice to the foundrymen.

The foundrymen have made no attempt whatever to reduce wages, and any report to the contrary is absolutely unjustifiable. The Cleveland foundrymen were ready to continue the wages of 1899, even though in their opinion the business conditions warranted a decrease.

There are thousands of idle iron molders in the country to-day because the volume of business has fallen off so greatly in comparison to that of 1899. There has not been the slightest attempt made on the part of the National Founders' Association to destroy the usefulness of the Iron Molders' Union of North America, or any of its local branches. On the contrary, the relations of the N. F. A. and the I. M. U. of N. A. have been of the most cordial nature throughout all the arbitrations of the past two years. Radical differences of opinion have not prevented the two associations from working harmoniously along the lines of common interest, and each recognizing in the other its ally and friend.

The strike precipitated by No. 218, of Cleveland, was in my opinion a most disastrous mistake in every sense of the word. It had no justification whatsoever. If those who are responsible for it had studied the conditions of trade with wisdom and without bias they would have committed their organization to no such folly. They had no excuse to offer for their act; they are to-day not fighting for any principle; it is not a question of life or death with the union. They are arrayed against an organization that has been the best friend the I. M. U. of N. A. has ever had outside of its own ranks; and they have plunged their Cleveland members into a war that will result in great loss, misery and hardship of every kind. While the foundrymen will suffer from the natural suspension of business during the continuance of this strike, still the great loss will fall upon the women and children whose fortunes are inseparably linked with the members of No. 218.

Yours very truly,

H. W. HOYT,
Vice-Pres. N. F. A.

Fires.

The foundry of Geo. L. McLynn, at Baker City, Ore., burned August 3.

A fire damaged the foundry of D. F. Hull & Son, at Hagerstown, Md., recently.

The Salem (Mass.) Brass Foundry, operated by Geo. J. Godsland, was slightly damaged July 20.

The Bignall plant of the Central Foundry Co., at Medina, N. Y., burned July 17. Loss estimated at $40,000.

William F. Duffus, of Brooklyn, N. Y., lost a large number of patterns and some machinery in a recent blaze.

The Hennessy Foundry Co., of Springfield, O., a new concern lately organized, suffered the loss of their plant July 27.

The Colorado Iron Works, at Denver, had the foundry and other portions of its plant destroyed lately. Loss reported, $40,000.

Among the Foundries.

King & Goodman have started a foundry at Cherokee, Kans.

The Central R. R., of Georgia, is erecting a foundry at Macon, Ga.

Royer & Zweibel have started a brass foundry at Wilkesbarre, Pa.

The Richmond Mfg. Co. is erecting a foundry at Richmond, Ind.

Letson & Burpee are erecting a new foundry at Fairhaven, Wash.

The Lunkenheimer Company, of Cincinnati, O., will erect a new brass foundry.

The Barberton (Ohio) Foundry Company has been organized by Messrs. Genet & Wenzel.

The Central Vermont Railway Co. has added an iron foundry to their shops at St. Albans, Vt.

Chas. E. Edgar has leased the foundry at Parsons, Kansas, heretofore operated by E M. Haubold.

The Gartland Foundry Co., of Cleveland, O., has increased its capital stock from $50,000 to $100,000.

The Caldwell Furnace Foundry Company, of Toledo, O., succeeds the Colton-Smead Furnace Foundry Co.

J. W. Dunham & Son, of Berea, O., are making additions to their plant, which will nearly double its capacity.

The Olympic Foundry Co. has been incorporated at Seattle, Wash., by Geo. H. Pieper, C. W. Kucher and L. Lukan.

The Maywood Foundry and Machine Co., of Maywood, Ill., has increased its capital stock from $50,000 to $75,000.

The Junction Foundry Co. has been incorporated at Worcester, Mass., by E. C. Thompson and Wm. Fenton. Capital, $10,000.

The Oliver Chilled Plow Co., of South Bend, Ind., are reported as intending to build a large new foundry in the immediate future.

The Featherstone Foundry & Machine Co., of Chicago, has been incorporated with a capital of $150,000. The incorporators are Will H. Clark, Howard M. Carter and Arthur Dyrenforth.

The Cambria Foundry and Machine Co., at Johnstown, Pa., has been organized, and purchased the foundry and machine shop of C. L. Tittle. The stockholders are John N. Horn, Harry Benshoff, George A. Hager, N. B. Griffith and A. J. Gairing.

The H. B. Ives Co., of New Haven, Conn., have moved into larger quarters. The brass foundry operated by the firm is located on the fifth floor of their new building.

Hereafter the four factories known as the N. O. Nelson plant, at Edwardsville, Ill., will run independently. The new corporations which materialized recently are: The Ledaire Manufacturing Company, capital $50,000; Illinois Marble Company, capital $15,000; Edwardsville Brass Company, capital $45,000, and the Bignall & Keller Manufacturing Company, capital $50,000. Each company applied for articles of incorporation at Springfield. N. O. Nelson made the following statement relating to the new departure: Our plant at Edwardsville manufactures four distinct lines of goods, each of which is sold partly through our St. Louis wholesale houses throughout the country. They have been established as parts of our business for from five to twenty years. We believe that better results can be obtained by having each factory do its own business and get credit for what it accomplishes and also by giving the opportunity to the managers and workers to become interested in the property and profits of the factory they work in. Our plan for many years has been to interest the operating force, but when the profits are made jointly by the wholesale house and all the different factories, the interest is very indirect. It is the intention to enlarge the business of each factory by selling more to the wholesale trade. The factories are all of the best standard construction and equipment; they have three side tracks into the premises, a single power house for all, with very cheap fuel, and possess every modern facility.

History of Connellsville Coke.*

F. C. KIEGHLEY.

The geologist tells us, that once, ages ago, a great sea spread all over the beautiful valleys and hills of what is now the Connellsville coke region. In this great sea, for ages there was deposited (and also grew within its bosom) great sheets of rank, luxuriant vegetation that can only be compared with that mass of vegetation that Columbus met with in his voyage of discovery, and that still exists in the tropical seas, and is known as the "Saragossa Sea." As the ages rolled on, this sea sank down and the great Allegheny mountains thrust forth their mighty flanks, the great sheets of vegetable matter were covered with sedimentary deposits, and in time became the seam of coal which is now known as the Connellsville seam. So much for science, which is really as much matter of history as the facts that follow.

In my search into the early history of the Connellsville coke region I ran across the following story:

A writer in "Forest and Stream" says that Elias Blank, one of the early settlers of what is now the great Connellsville coal region in Western Pennsylvania, was among the first Americans to burn soft coal. How the thing came about is thus described: One night

*Read before the Central Mining Institute of Western Pennsylvania.

Mr. Blank was aroused by a rapping at his door. Opening it, he admitted a famous Indian fighter, Lewis Whetzell, and a companion, Jonathan Gates, commonly known as "Long Arms."

"Friend Lewis," said Blank, "where have thee and our friend been, and where bound?"

"I want to get out of here at once," said Whetzell, "and Long Arms is of the same opinion. This country's bewitched, and Long Arms and I are nearly scared to death."

"Friend Lewis, thee must not tell such stories to me," said old Elias. "Thee knows I am thy friend, and I have saved thee when a price was on thy head. I know thou art a man of courage, and friend Jonathan Gates, whom some call Long Arms, fears nothing on earth, and I'm fearful nothing anywhere else; and yet thou tellest me that he and thee are scared even almost unto death. Shame on thee to declare before thy friend, who loves ye both as he were thy father."

"No, no, Elias," said Whetzell, dropping into the Quaker speech. "I tell thee no lie. We are scared. Yesterday afternoon we were hiding about a mile from Dunkard creek, and in the evening we built a fire under the bank very carefully, and we got some black rocks to prop up a little kettle, and put them beside the fire rather than in it, and the black rocks took fire and burned fiercely, with a filthy smoke and bright light, and Long Arms said the devil would come if we stayed, and we grabbed our kettle and poured out the water, and made our way here, leaving the black rocks to burn."

Elias Blank was much interested. He did not tell Whetzell what the black rocks were, but he found out exactly where the men had made their fire, and when they went away he gave them each a new Ezra Engle rifle, a knife, and a tomahawk, with four pounds of powder and a supply of lead. Then he hunted up their camping ground, found the "black rocks" and opened a coal bank into one of the river hills; and this coal bank is still in existence in a 12-foot vein of coal that is absolutely free from slate and burns like pitch.

For the next that I have been able to find, I am indebted to Mr. Thomas Lynch, president of the H. C. Frick Coke Co.

It seems that, "In 1816 and 1817, Isaac Mason built the first rolling mill erected west of the Allegheny mountains, to manufacture iron at Plumsock, Fayette county, Pa. This mill went into operation September, 1817, and coke was used in the refinery. This is the first definite statement that can be found concerning the use of coke in this country." It seems that the coke industry really began within the confines of Fayette county.

In 1837 F. H. Oliphant made coke at his Fairchance furnace, near Uniontown, Pa. All the early coke was made on the ground in what was known as coke ricks.

The first coke made in ovens was in about 1841. In that year Provence McCormick and James Campbell, two carpenters, and John Taylor, a stone mason, commenced making coke with two ovens, and in the spring of 1842 had enough coke stocked to fill two boats, or about 800 bushels, which they took down the river on a high stage of water, to Cincinnati, Ohio. On reaching that city, they found that the demand for coke was not as brisk as they hoped to find it. The new fuel was unknown there; foundrymen regarded it with suspicion, calling it "cinders." Campbell, who went with the boats, remained at the landing three weeks, retailing out one boat load in small lots at 8 cents per bushel. He traded the balance to Miles Greenwood, a foundryman at Cincinnati, for a patent iron grist mill. This mill was brought to Connellsville, Pa., and when put in operation was found to be a failure; it was sold for $30; and so ended the first coke manufacturing firm in the Connellsville coke region. A part of their cargo, which had been traded for the patent mill, was afterward boated by canal to Dayton, Ohio, and was there sold to Judge Gebhard, a former resident of Pennsylvania, who then had a foundry in operation at Dayton. He used the coke in his establishment and found it so well adapted for his purpose that he soon after come to Connellsville and proposed to Campbell and McCormick to make more; but the result of their previous venture in the coke trade satisfied them.

In 1843 the ovens built by Taylor were rented to Mordecai, James, and Sample Cochran, who used them in making 24-hour coke. When they had coked about 1,300 bushels, it was boated to Cincinnati and sold to Miles Greenwood, who, in the meantime, had become acquainted with the value of coke as a fuel.

About 1853 three or four ovens were built and put in operation by Stewart Strickler, the product being boated to Cincinnati and sold. For some years but little coke was made, though a few ovens were built, and that knowledge acquired, that was necessary for the coming development of the trade."

The trade increased somewhat in 1851, and in 1855 there were but 26 coke ovens above Pittsburg. It was not until the Baltimore & Ohio railroad was completed to Pittsburg, and Connellsville coke had been used successfully in the Clinton furnace at Pittsburg, that its value as a furnace fuel was fully demonstrated and the foundation laid for the demand which has resulted in such an unprecedented development of coke manufacture in the Connellsville coke region. The Clinton furnace was blown in about 1859 to make pig iron from coke. The coke was first made from Pittsburg coal near the furnace on the south side of the Monongahela river. It was run about three months, the coke proved unsatisfactory, the furnace was blown out, and arrangements made to secure a supply of coke from the Connellsville region. The furnace was again put in blast in the spring of 1860, using coke made from the Fayette Coke Works, comprising about thirty ovens which were also erected in that year. (Mr. George S. Griscom, whom so many of you know, tells me that he was superintendent of the Fayette works, if I remember rightly, over thirty years ago. This would, I think, make him one of the first, if not the first, superintendent of the region.) Forty ovens were built on Hickman run in 1864. The product of these ovens was transported on a tramway to the Pittsburg & Connellsville railroad until 1871, when the Hickman Run Branch railroad was built. In 1860 the Connellsville Gas, Coal & Coke Company, was organized, and built 40 ovens near Connellsville. In 1869 40 ovens were built near Dunbar, Pa. The works above named were about all the ovens in the Connellsville region up to 1871.

The United States census reports for 1850 show that there were but four establishments making coke in the United States up to that time. In 1860 there were 21; in 1870 there were 25. The number of establishments returned in 1850 is probably not correct. It is true the manufacture of coke at that time was in its infancy in this country; but it was without doubt more of an industry than the returns for 1850 indicate. The census returns for 1850 and 1860 show that all the coke produced in the United States was made in Pennsylvania; and in 1870, 92 per cent.; 1880, 84.18 per cent.; and of the whole quantity made in Pennsylvania, Westmoreland and Fayette counties, or the Connellsville coke region, produced 73.16 per cent.

In 1871 the Mt. Pleasant & Broad Ford railroad (of which H. C. Frick was one of the projectors) was built, which opened up the northern ends of the region, and inaugurated the construction of several plants. In the same year H. C. Frick and his associates, operating under the firm name of Frick & Co., started into the coke business with 300 acres of land and fifty ovens, known as the Frick works. In 1872 the Mt. Braddock, Jimtown, and Valley works were built, and about the same time Frick & Co. added fifty ovens to the Frick plant and built the Henry Clay works of 100 ovens on the Youghiogheny river near Broad Ford. Oven building continued until the total number in 1873 was 3,673.

I will now follow Mr. Lynch's data by reference to the Geological Survey reports.

In Vol. L, Second Geological Survey of Pennsylvania, dated 1876, I find that the number of coke plants in existence in the Connellsville coke region at that time is given as forty-five, the number of coke ovens as 3,578, and the weekly output as 26,000 tons. It is further said that in that report that "Perhaps the most surprising feature of this enormous business is its sudden and recent growth; nearly all of these ovens having been built within the last ten years.

Before 1865 the trade was small, the market chiefly local to the Pittsburg trade, the reputation of the coke much less widespread, and the number of coke ovens growing slowly. Since that time the increase of the business has been amazing.

Other coking districts have enlarged their capacities also; much coke, and of good quality too, now coming from the line of the Pennsylvania railroad from Blairsville to Pittsburg."

You will observe that the writer just cited states that the increase in the coke business to 26,000 tons per week was amazing. What would he say about the present output of

200,000 tons per week now being marketed? This marks an increase of eightfold in only 23 years.

Referring to Thomas Lynch again:

In this year (1873) the great financial panic occurred, and the iron business commenced to decline; the price of coke naturally went down in sympathy with it until 1879; then came a sudden and unprecedented demand, and prices, which had previously ranged for several years from 90 cents to $1.15 per net ton at the ovens, advanced to $5 per ton. This boom naturally gave impetus to the coke trade, and on May 31, 1880, there were 6,237 ovens built, and 1,242 in the process of construction in the region.

This brings us up to 1880. Through the kindness of my friend, E. W. Parker, statistician, of the United States Geological Survey, Washington, D. C., I am enabled to present to you the following statistics relative to the manufacture of coke in the Connellsville coke region from the end of 1880 to the end of 1898:

From a review of the statistics just given, it seems that from 1880 to 1883, the coke output rose from 2,205,946 tons to 3,552,492 tons, or an increase in three years of 61 per cent.

In 1884 and 1885 the trade declined, and at the end of 1885 the output was 456,399 tons down as compared with 1883. In 1886 it suddenly jumped up over 1,000,000 tons as compared with 1885. In 1887 it dropped back slightly—33,532 tons. In 1888 it increased again over 800,000 tons. In 1889 and 1890 it rapidly advanced again, and at the end of 1890, as compared with 1887, it had increased 2,317,167 tons. In 1891 it fell back again 1,703,491 tons. In 1892 it recovered itself and regained 1,568,787 of the 1,703,491 lost in 1891. In 1893 it plunged back lower than its record of 1888—five years before—and lost in output, compared with 1892, 1,523,829 tons. In 1894 the output rose again and recovered 386,457 of the 1,523,829 tons lost in 1893. In 1895 it took an immense leap forward, gaining in one year the amazing amount of almost 3,000,000 tons. In 1896 there was another slump down of 2,718,689 tons. In 1897 it gained over 1,400,000 tons. In 1898 it gained 1,454,524 tons, bringing the output up to January 1, 1899, to the enormous sum of 8,315,359 tons. The figures for 1899 are not yet known, but I should estimate it at an increase of over 1,000,000 tons; for, as before stated, the present output is at the rate of 10,560,000 tons per annum.

Nothing can better illustrate the progressive character of the men that conduct the coke industry, than the fact that one firm —the H. C. Frick Coke Co.—has in 28 years increased its holdings from 300 acres of land and 50 coke ovens to 40,000 acres of coal, and now control the product of 52 plants in the region, aggregating 11,209 ovens, and four water plants with a pumping capacity of 8,000,000 gallons of water daily. For the equipment of its plants, it has 52 miles of railroad track, 28 locomotives, 2,500 railroad cars, 92 pairs stationery engines, 42 miles of wire rope, 198 steam boilers, 5,100 mine cars, 280 miles of mine track, and 740 horses and mules. It is supplied with coal from 50 mines, 22 drifts, 15 slopes, and 13 shafts. The latter vary in depth from 50 to 542 feet; slopes vary from 180 to 6,600 feet horizontal depth, and some of the drifts extend over two miles underground.

The coking field of itself is of limited area, and extends from a point near Latrobe, on the Pennsylvania railroad, in a southwesterly direction, through Westmoreland and Fayette counties, a distance of 42 miles almost to the West Virginia line, with an average width of 3.5 miles, covering an area of 147 square miles and, excluding barren measures, originally contained 88,000 acres, of which there are yet (I will say, January 1, 1899) as near as I can ascertain, about 62,000 acres of available coal yet to mine. At the present rate of production, this coal would last 50 years, but if it should increase in the ratio that it has in the past ten years, it would be exhausted in 25 years. This 62,000 acres of coal at $1,500 per acre, which is now considered a fair figure, would make its value at the present time the enormous sum of $93,000,000. At one time Connellsville coking coal sold for $12.50 per acre, so it has increased in value 120-fold. As shown by Parker, "the value of the coke manufactured in 1898 was $12,626,292." I estimate that for the year 1899, owing to the increased production and advance in prices, the value of the coke manufactured will reach well up to $20,000,000. The Connellsville coke industry furnishes directly, employment to over 20,000 men, and indirectly, to several hundred thousand.

These figures of themselves are astounding; yet I am going to furnish some that are still more marvelous.

Ten million tons of coke per annum means the consumption of 15,000,000 tons of coal, to which we must add at least 1,000,000 tons more to cover what is used about the mines, and the wastes of various kinds incurred in handling. This does not include what is lost in bad mining. This brings the sum total of coal per annum to 16,000,000 tons; 5,000,000 tons of this amount is thrown into the atmosphere in the shape of volatile matter, which in turn, contains many valuable by-products, such as ammonia, tar, gas, heavy and light oil, benzol, toluol, xylol, phenol, naphtha, anthracene, creosote, pyridine, pitch, etc. Of ammonia alone not less than 50,000 tons were thrown into the atmosphere during the year 1899 by the coke ovens of the Connellsville region, no doubt adding materially to the fertility of our land; for nature never wastes anything, and it is in all probability precipitated.

Sixteen million tons of coal per annum means practically 52,000 tons of coal per day. If we throw this into its equivalent horse-power, at the rate of two pounds of coal per hour per horse-power, which is now developed in high-class engines, it would equal the work of 520,000 horses working ten hours per day under the Watt standard, which is one-third greater than the real horse power making an actual horse power of 780,000, or equivalent to the work of 7,800,000 men for ten hours. Scientists tell us that, as yet we get but 10 per cent. of the actual power contained in a pound of coal, so a day's work of the Connellsville coke region is really a consumption of force equal to that exerted by 78,000,000 working men, or more than the whole population of the United States.

During the past 20 years in which I have been connected with the coke industry, I have time and again heard iron and steel makers claim that they have found other cokes that answered their purpose, but I have always noticed that they were in the market for Connellsville coke when they had to make a fine grade of iron or steel. Every time a man or company found a new coal field, they came out with the glowing statement that it was as good as Connellsville coal. Why, I have seen alleged Connellsville coal and coke from every section of Pennsylvania, Ohio, West Virginia, Virginia, Indiana, Illinois, and even the Pacific slope, and here is the latest Klondike, right at our doors, basing its future greatness on the reputation of Connellsville coal. The fact is, that every one is anxious to prove that he controls a field of genuine Connellsville coal, no matter whether it is located on the top of Pike's Peak or in the Dismal Swamp.

No one, not even Mr. John Fulton, our greatest coke expert, can tell you just why Connellsville coke is what it is, for nature guards her secrets well, and Connellsville coke bids fair to hold its own for many years to come; and after all, the proof of the pudding is in the eating. When those gigantic 700-tons-per-day furnaces are fed on on any coke but genuine Connellsville coke, their digestive organs very soon get out of order.

As to cheapness of production. There is no other coal as regular, as uniform, of as convenient a thickness, as Connellsville coal, and as easily mined. These are not mere statements, but facts; facts that have made Pittsburg the steel center of the world; facts that have taxed the three great railroad systems of southwest Pennsylvania to their very uttermost; facts that have in 30 years brought up the output of blast furnaces from 35 tons to 700 tons per day; and facts that are going to make the United States the greatest nation on earth.

Casting Gears in Baked Molds.

I have read of some shops making fine gears for printing press work by using a cut gear for a pattern ramming up the mold and leave the pattern in the sand and dry the mold when the pattern is said to draw well and leave a perfect mold.

Could some of the readers of The Foundry inform me what kind of a sand mixture is used for a facing that will not crumble nor stick to the iron pattern?

We have an iron worm gear pattern (the teeth are cut) which it is desired to cast instead of cutting the teeth. I would like some suggestions of others who have had experience in making molds for worm gears as to rig for drawing pattern, sand used, etc.

D. A. POTTER.

Beer Causes Trouble.

The molders employed at the Indiana stove works in West Illinois street are on a strike because the company will not allow them to "rush the growler" while on duty.

The men say they need their beer during working hours and do not propose to do without it.

Until Jan. 1 last the men were allowed to "rush the can" all they pleased, and it is said some of them spent considerable time going after their beer. The company decided to stop the custom of "can rushing" and posted bills to the effect that after Jan. 1 the custom would be discontinued but agreed to give the men twenty minutes each day in which time they could go where they pleased to get their beer.

The men were given ten minutes in the morning and ten in the afternoon and the company did not dock them for the time. The new rule worked all right until hot weather set in and the men decided that twice a day was not enough time for them to get their beer and some of them proposed that the old rule should be put in force.

Tuesday morning some of the molders went to the company's office and asked that the new rule be abolished and the old rule re-established. They threatened to break the rule if the company refused to grant their request. The officers of the company said that under no circumstances would they go back to the old rule and insisted that any one who was guilty of "rushing the can" on the premises would be discharged. They explained that the new rule was the best and that it must stand as it meant much for the company. About twenty of the molders made this request.

The answer of the company was not what the men wanted and in the afternoon, in violation of the company's rule "rushed the can."

When these men came to work on Wednesday morning they were told their services were no longer needed at the foundry unless they would promise to live up to the rules in the plant. The leader of the men said he wanted to discuss the matter with the men and that they would go outside and return in ten minutes and make an answer. They returned in ten minutes and the leader announced that the men had agreed to stand pat and strike if they were not permitted to "chase the bucket." The company then informed the men that they were no longer in their employ.

Several of the other men followed and in the afternoon there was not a union man working in the molders' department.

The molders held a meeting Wednesday night at their hall at the corner of Pennsylvania street and Third avenue and discussed the matter at some length. After the meeting they announced they had nothing for publication.

One of the molders was seen and said as for his part he was not going back until the company agreed to let him "rush the growler" any time he pleased. He insinuated that every man in the department felt like he did about the question.

In all there are about forty men out. Mr. Boehne says there are five or six men and about twelve apprentices who remained at work.

The officers of the Indiana stove works are: President, Jacob Fischer; vice-president and treasurer, J. W. Boehne; secretary, Henry Karges.—Evansville (Ind.) Courier.

Southern Iron Industry.

A review of the industrial operations in the Southern iron field and the Birmingham district for the first six months of 1900, says a Birmingham, Ala., dispatch, show continued development along these lines. The total shipments of pig iron from Alabama and Tennessee for the period named was 689,508 tons, a decrease from the same period of last year of 68,288 tons. But last year there were 235,000 tons of accumulated stock of pig iron to draw from for shipments and these stocks were exhausted during the year, leaving practically none on hand at the beginning of this year. Therefore the amount of iron shipped from Alabama and Tennessee this year was manufactured this year, and it is thus apparent that 140,000 more tons were made the first six months of 1900 than during the corresponding period of 1899. Pig iron shipments from the Birmingham district alone for the first six months of the present year were 433,492 tons, a decrease of 17,527 tons. Accumulated stocks in this district last year were nearly 150,000 tons.

The cast iron pipe business for the first six months of this year was largely under

that of the same period of last year. Pig iron was high and cast iron pipe was held at fancy prices, owing to the increased cost of production. The result was that work on water mains and sewers, which had been projected, was suspended, waiting for a declining price. Pipe manufacturers make only on orders and the orders being scarce, pipe production was small. It bids fair to pick up again as iron is on the decline. Total pipe shipments from Alabama and Tennessee during the above period were 31,209 tons a decrease from last year of 51,906 tons, or nearly 200 per cent. Shipments from the Birmingham district alone were only 9,377 tons, a decrease of 22,045 tons, or over 200 per cent.

For the above period the production of coal was 4,500,000 tons, an increase over the same period of last year of 550,000 tons.

The coke industry has developed in like proportion, probably 300 new ovens having been fired in the Birmingham district alone, and several hundred more being in course of construction.

Plenty of Time Outside.

The Norwalk Iron Works has issued and posted a new order to the effect that newspapers must not be read in working hours in the shop.—Norwalk (Conn.) Correspondence.

A Common Complaint.

On account of the poor quality of iron received by the Hannibal Stove Co. during recent shipments, it was feared the foundry would be compelled to shut down, but it is still running, and if the next consignments of iron are of a better grade the foundry will not shut down at all. The iron of recent shipments was of such poor quality that the molders could do but little with it and almost decided to quit using it entirely.—Quincy (Ill.) Journal.

A E. McGarry, superintendent of the Greenville (Texas) Foundry and Machine Works, relates an amusing incident which occurred some time ago when the head molder came running to him and advised him that he could obtain no wind from the fan. Upon investigation it was found that the fan was running backwards, some miscreant having arranged the belts so that this became possible.

Good for Oskaloosa.

The Greasby Foundry last week by dint of hard labor from daylight to sunset succeeded in getting out a heavy order of grate bars for the Oskaloosa Paving Brick Works. During the first four days of the week and up to the time that the order was completed the foundry turned out seven tons of castings. This is a pretty good record for an Oskaloosa foundry.—Oskaloosa (Ia.) Herald.

Brick for Foundry Floors.

The Great Western Stove Company has been using the force of men employed in the molding room during the last few days to pave the floor of the room with vitrified brick. Molding room B was paved last year with brick and has given such satisfaction that all of the molding rooms will be paved.

In the present work it will require 65,000 brick to pave the floor. Sidewalk brick are used and are grouted with cement. The advantage of brick flooring is that the molding boxes and castings do not cut into the floor as in the case with dirt floors.—Leavenworth (Kans.) Times.

One Reporter's Idea.

The work of casting is quite interesting, particularly if a person is fortunate enough to happen to be at the foundry when the work is in progress. First a model the exact counterpart of the article desired has to be made. This is placed in sand enclosed in a casing made of wood, the sand is then hardened by pressure and water until it has the stability to remain in a fixed position, after which the mold as this has become by this time is separated into two pieces and the model taken out. Some times the sand will not remain in the desired position, but crumbles off at places, then a new one has to be made. After the model is completed it looks like a box of dirt with iron hooks on the sides to keep from bursting. Then the scrap and pig iron are thrown into a smelter where it is melted, the moulton iron is taken to the mold and turned into a small hole in the top. As soon as the iron has cooled to a solid the mold is knocked to pieces and the casting is completed, with the exception of the finishing up.—Livermore Falls (Me.) Express.